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FEBRUARY 25, 1957

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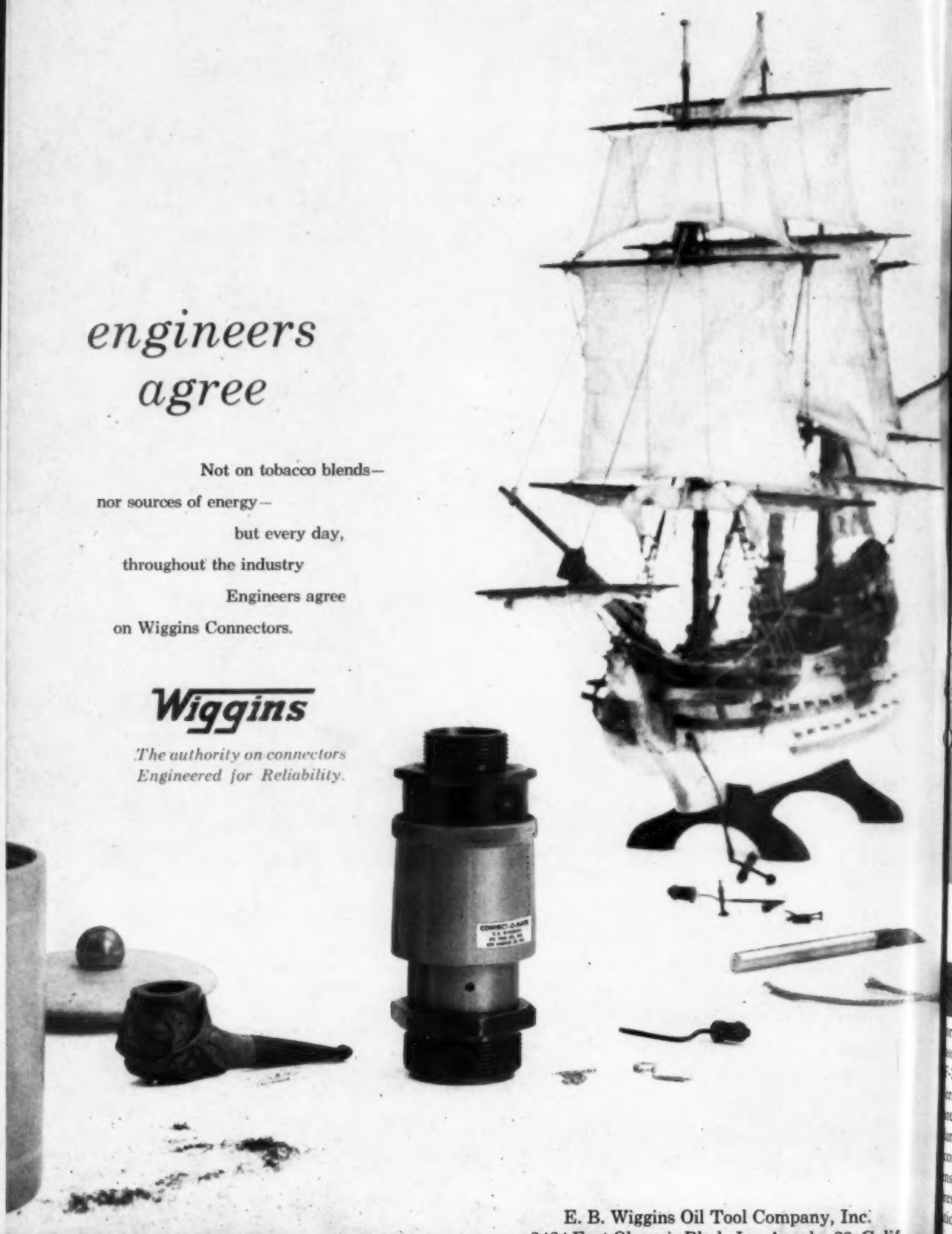

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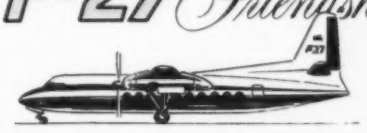

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Phone: Sterling 3-5400. Cable: AMERAV.

Advertising Offices: 17 East 48th Street, New York 17, N. Y., USA.
Phone: Templeton 8-5446.

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West Coast: 8943 Wilshire Boulevard, Beverly Hills, Calif., Fred S. Hunter, manager; John Ball, Jr., and Walton E. Brown, Regional advertising managers. Phone: Bradshaw 2-6561, and Crestview 6-6605.
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PUBLISHING INFORMATION
Published: Every other Monday by American Aviation Publications Inc., Washington, D. C. Printed at The Telegraph Press, Harrisburg, Pa. Entered as Second Class Matter in Washington and Harrisburg.
Subscription Rates: For U.S. and Canada—$5.00 for 1 year; $8.00 for 2 years. Other countries—$7.00 for 1 year; $12.00 for 2 years. Subscription limited to aviation industry personnel.
Incorporates: Airports and Air Carriers; Aviation Equipment, The American Pilot; Aviation Sales & Service; U.S. Aviation; and American Airports.

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Change of Address: Send old address (exactly as it appears on mailing label on your copy of magazine) and new address, including zone number if any, to American Aviation, 1001 Vermont Avenue, N.W., Washington 5, D. C. Allow two weeks for changeover.

PUBLISHING CORPORATION
American Aviation Publications Inc.: Principal offices at 1001 Vermont Ave., N.W., Washington 5, D. C. Wayne W. Parrish, president; Leonard Eiserer, executive vice president and general manager; William H. Pearson, vice president and director of advertising; Albert H. Stackpole, Eric Bramley, Robert H. Wood, Fred S. Hunter and Robert R. Parrish, vice presidents; Leonard A. Eiserer, Secretary-Treasurer; Louis C. James, Ass't Secretary-Treasurer.

OTHER PUBLICATIONS AND SERVICES
American Aviation Daily: Daily News service for the entire industry, $200 per year. Managing Editor—Keith Saunders.
American Aviation World-Wide Directory: Twice-yearly listing of products, people and organizations, $9.00 each (U.S.A. and Canada); $10.00 each Overseas. Managing Editor—Marion E. Grambow.
Official Airline Guide: Monthly publication of airline schedules, fares, World-Wide Edition: $19.50 per year, everywhere. North American Edition: $13.50 per year in U.S.A. $14.00 in Canada: $15.00 elsewhere. Published from 139 N. Clark St., Chicago 2, Ill. Phone: Central 6-5804. Managing Director—Robert R. Parrish.
Missiles and Rockets: Magazine of World Astronautics. For those in missiles and rocket industry and satellite science, $8.00 for 1 year; $12.00 for 2 years (U.S.A. and Canada); Overseas—$9.00 for 1 year; $14.00 for 2 years. Managing Editor—Erik Bergaust.
Air Traffic News (incorporating Air Traffic Digest): Daily rates and tariff news, $200 per year: Managing Editor—Mary Miller.
Airports: Weekly newsletter for airport officials suppliers and services. Airmailed every Friday, $25 per year. Managing Editor—Wallace I. Longstretch.
Air Information Division: 595 Broad Avenue, Ridgefield, N. J. Phone: Whitney 5-8850. Director—Edward H. Henkler.
Who's Who in World Aviation: First Edition over 2,000 biographies of aviation's leaders. 345 pp. Deluxe bound, $10.00 per copy, postpaid.
Aircraft Year Book. Aviation Facts and Figures (Official Publications of Aircraft Industries Association).

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BPA NBP

Contents

FEBRUARY 25, 1957

VOL. 20 NO. 20

INDUSTRY ROUNDUP

Facts Belie Wild Charges of Jet Deafness 29
CAA Predicts 118 Million Passengers by 1970 31
Congress Gets New Aviation Bills 30
Pushbutton Loading for Electra Baggage 38

PRODUCTION

Douglas Starts Assembling the DC-8 35

ENGINEERING

Fenwal Fire-Heat Detector: A New Approach 39
Needed: Breakthrough on 1,800°F Alloys 43

ELECTRONICS

Here's a New Miniature High-Resolution Radar 50
Experts Debate Means of Easing Spectrum Crowding 53

BUSINESS FLYING

Business Fliers Learn About Jets from AF 54

TRANSPORT

How to Ground-Handle Jets: Move Them on Rails 74
Twin Headache: No Shows and Oversales 76
How Bristol Licked Britannia Flame-Out 80

EMPLOYMENT

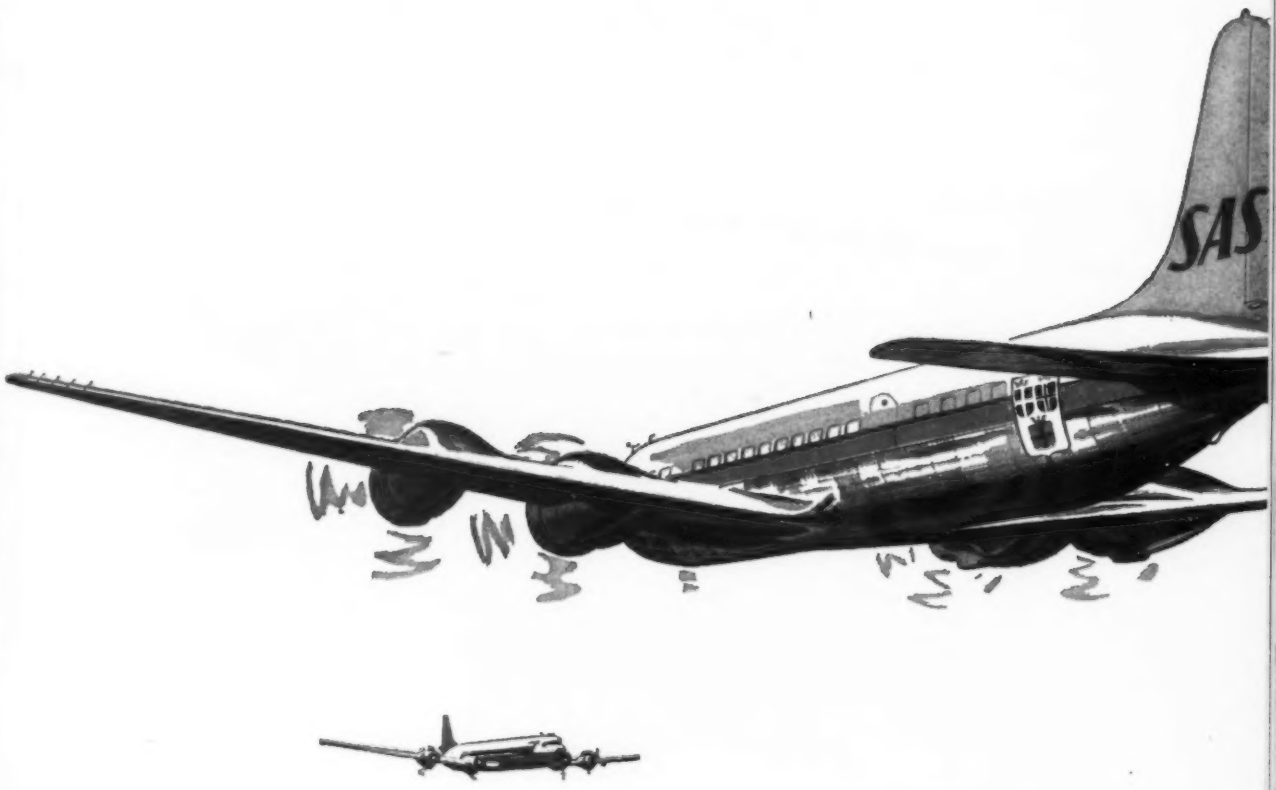
M-H Flies Employes to New Florida Plant 83

DEPARTMENTS

Personal View 9
When & Where 10
Letters 14
Books 14
Washington Report 21
News Digest 22
Airtrends 27
New Products 59
West Coast Talk 67
International Aviation 68
People 71
Transport Trends 73
Sam Saint Says 81
Airline Commentary 82
Contracts & Facilities 84
En Route 86

PHOTO CREDITS

Douglas, p. 35; Lycoming, p. 40; U.S. Army, p. 50; U.S. Air Force, p. 54; Canadair, p. 68; Jack Snyder, p. 74; United Air Lines, p. 76; James H. Stevens, p. 80; International Harvester, p. 82.



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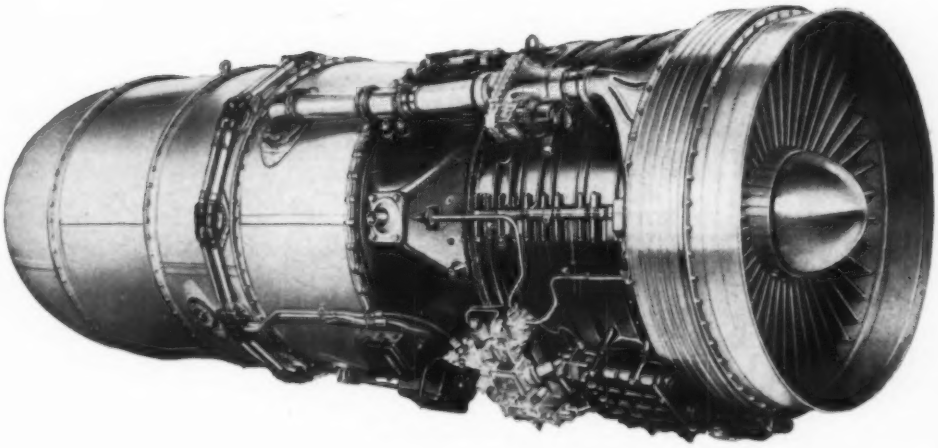

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WESTERN AIRLINES

Personal View

By WAYNE W. PARRISH

Phrase to Watch: Over-Facilitization

AIRCRAFT MANUFACTURERS would do well to evaluate their present plant facilities. As of now.

The missile is not only bringing about a revolution in warfare, but will create a revolution in manufacturing processes.

Over-facilitization will be a phrase heard often in the years immediately ahead. Missile production not only requires much less plant area than airframes but obviates the need for the huge cavernous structures with which aircraft manufacturers have long been identified.

This is no empty warning. Major General David H. Baker, director of procurement and production for the USAF Air Materiel Command, spoke frankly about over-facilitization at an Aviation Writers Association luncheon in Washington not long ago.

It is not difficult to read between the lines when General Baker tells the aircraft builders to evaluate their plant facilities now. He doesn't say so in just so many words, but it is clear that the USAF has no intention of paying the cost of maintaining excess plant facilities.

Within the next few years 35% of manufacturers' deliveries will be of missiles within the same amount of money now being spent, compared to 8% presently. More than one airframe line will be phased out in the next year or so.

The significant point is that the required square-footage of plant space per dollar of missile will be considerably less than the per dollar of aircraft.

Over-facilitization cannot be solved by withdrawing government-owned plants from active production since these facilities are invariably more modern than those owned by the contractors themselves.

Those aircraft builders in commercial business have less to worry about than some of the others, but there are a few aircraft manufacturers who have no prime missile business lined up and will face a phase-out of certain airframe lines. Subcontracting of missile work would seem to be their best bet for the future, since missile subcontracting will follow the same pattern followed in the aircraft field.

Although the Air Force apparently is going to bear down heavily on over-facilitization it is at the same time looking with much favor on present expansion and modernization of test facilities and the build-up and centralization of research and development centers by industry.

Aircraft builders will be using poor judgment if they think the Air Force will continue its earlier program of maintaining extensive stand-by plants for airframes. The missile is not only in the process of outmoding certain forms of warfare but is also altering the entire concept of standby facilities. It is time to take stock—now.

Eleven Years Is A Long Time

ONLY ON rare occasions on this page do we make observations about operating routes and only then when the interests of the Nation or the public supersede everything else.

With that introduction, we join the chorus being raised in California and the west generally about the 11-year stall by the Mexican government over the granting of rights to a U.S. carrier to operate between Los Angeles and Mexico City. In all the world we doubt that there is a more flagrant abuse of selfish interests in preventing a fair and reasonable development of air commerce in the interests of the traveling public.

The route has been held tenaciously and solely by CMA, the Mexican carrier, since 1924. In 1938 it received "grandfather" rights from the U.S. to which it was fully entitled. In 1946 the Civil Aeronautics Board awarded a certificate on the route to a U.S. carrier (Western Air Lines) but this carrier has never been able to activate the certificate because Mexico and the U.S. have never been able to come through with an air agreement. The major reason is Mexico's insistence on exclusive rights to the Los Angeles route for CMA.

Eleven years is a long time for a stall and we think the time is overdue for some concrete action by the U.S. even, if necessary, such drastic action as the suspending of the CMA permit until some reciprocation can be obtained in a bilateral agreement.

Los Angeles-Mexico City is no more deserving of exclusivity than London-Paris or Los Angeles-Chicago. Someone has estimated that there is a current business of 90,000 passengers a year out of Los Angeles for Mexico City. There are more Mexicans living in Los Angeles than in any other city of the world outside Mexico City itself. The only alternative to using CMA is to travel the long distance east to Texas for a connection southbound.

CMA is a good airline. It has a good record. But in these days of air transport expansion around the world there seems to be no justification whatever for CMA expecting to maintain an exclusive franchise indefinitely. It is contrary to every experience and precedent in the world. So far as we can determine, the U.S. has bent over backwards to extend to Mexico a wide variety of routes into the U.S. It has agreed to everything except a right which it can hardly give away in the public interest and that is an exclusive on a major traffic artery.

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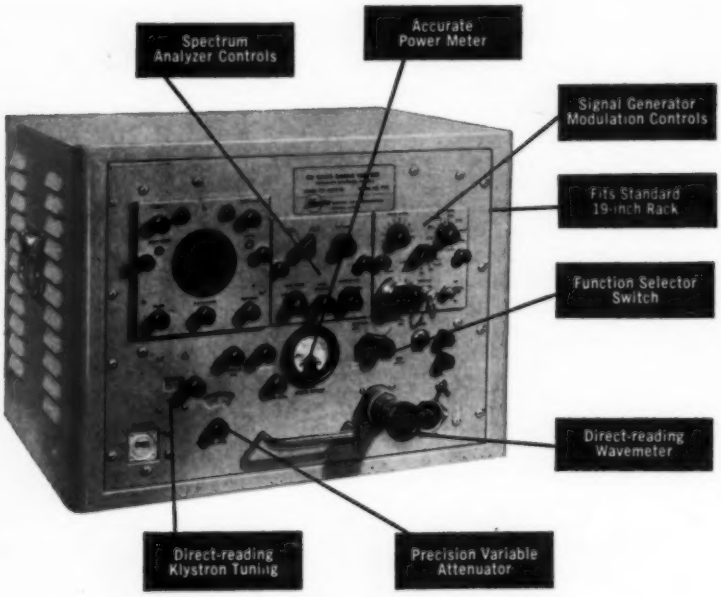

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When & Where

FEBRUARY

Western Joint Computer Conference, sponsored by IRE, AIEE and ACM, Hotel Statler, Los Angeles, Feb. 26-28.

Management Research Symposium on Transportation, Purdue University, Lafayette, Ind., Feb. 27-28.

MARCH

Annual Air Safety Forum of Air Line Pilots Assn., Hotel Shoreland, Chicago, Mar. 5-7.

National Conference on Aviation Education, sponsored by National Aviation Education Council, Mayflower Hotel, Washington, D.C., March 7-8.

Nuclear Congress & International Atomic Exposition, Convention Hall, Philadelphia, Mar. 11-15.

IAS Flight Propulsion Meeting (classified), Hotel Carter, Cleveland, Mar. 14-15.

IRE National Convention, Waldorf-Astoria, New York City, Mar. 18-21.

Gas Turbine Power Conference, sponsored by ASME, Sheraton-Cadillac Hotel, Detroit, Mar. 18-21.

American Society of Tool Engineers, Silver Anniversary meeting, Shamrock-Hilton Hotel, Houston, Tex., Mar. 25-27.

Western Metal Exposition and Congress, sponsored by American Society for Metals and other technical groups, Pan-Pacific Auditorium and Ambassador Hotel, Los Angeles, Mar. 25-29.

APRIL

SAE Aeronautic Meeting and Production Forum, Hotel Commodore, New York City, Apr. 2-5.

American Rocket Society, national annual spring meeting, Sherton-Park Hotel, Washington, D. C., April 4-6.

IRE Professional Group on Telemetry and Remote Control, national symposium, Philadelphia, Apr. 15-17.

Arnold Air Society annual conclave honoring 50 years of military air power, Hotel New Yorker, New York City, April 17-20.

Airport Operators Council, Conrad Hilton Hotel, Chicago, Apr. 28-May 2.

MAY

American Assn. of Airport Executives annual convention, Shamrock-Hilton Hotel, Houston, Tex., May 5-8.

Aero Medical Assn. 28th annual meeting, Shirley Savoy Hotel, Denver, May 6-8.

American Helicopter Society, annual forum, Sheraton-Park Hotel, Washington, D. C., May 8-11.

Armed Forces Communications and Electronics Assn., convention, Sheraton-Park Hotel, Washington, May 20-22.

Design Engineering Conference of American Society of Mechanical Engineers, Coliseum, New York City, May 20-23.

Aviation Writers Assn., annual convention, Chase and Park-Plaza Hotels, St. Louis, May 26-June 2.

JUNE

First Annual Trade Show, National Aviation Trades Assn., Monmouth County Airport, N. J., June 1-9.

American Society of Mechanical Engineers, semi-annual meeting, Sheraton-Palace Hotel, San Francisco, June 9-13.

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Few structural alterations. Installation of ELANDS in the Convair 340 has meant remarkably few modifications—and these have taken place ahead of the main engine bulkhead frame, which has otherwise been retained unaltered from the original installation. Other alterations have been confined to the instrument panel, the control quadrant, and the aircraft electrical system (adapted to include a circuit for Napier 'Spraymat' electrical de-icing of engine intake, propellers and spinners).

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Mr. Joe Russell, Engineering Personnel
Room 10-F4, Temco Aircraft Corp., Dallas, Texas

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Letters

More Praise for Saint

To the Editor:

I think it (Sam Saint's column) is a fresh breeze in a stagnant atmosphere and I like it very much indeed. How nice it is to read opinions that are so clear-cut that one can either agree or disagree with little hesitation. I am sure that I shall find myself agreeing as a rule.

HOWARD K. MORGAN,
Director,
Commercial Aviation Systems
Bendix Aviation Corp.
Detroit, Mich.

To the Editor:

I am enjoying Sam Saint's columns in AMERICAN AVIATION, and am enthusiastic about the prospects of having so sound a technician expose those areas of the most important problem facing aviation in the United States today . . . It is an easy thing to get lots of people to do the easy jobs. Here we have a very difficult and complicated job requiring not only technical knowledge and skill, but sheer guts to accomplish. It is high time that we had all the cards out on top of the table on this matter and I know that Saint is the guy to do it . . .

E. J. FOLEY
1711 Massachusetts Ave. N.W.
Washington, D. C.

To the Editor:

I hope that people who are in a position to take necessary action in the air traffic control field read Sam Saint's columns as carefully as I do.

WILLIAM P. KENNEDY
Assistant Manager
Sales Engineering
Lockheed Aircraft Corp.
Burbank, Calif.

Another Dissent

To the Editor:

. . . Perhaps Mr. "Name Withheld Upon Request" can strap 200,000 pounds or more on his back and thread his way IFR from Idlewild to Midway with nothing more involved than a "one-man" 5-minute takeoff and 5-minute landing, but the faint tinkle of silvery laughter tells me that the old pros recognize an "over-the-weather pilot"—when the weather is over, he can fly.

Since I am not an airline pilot I cannot say with certainty just what they think they are, but I can and will say that I think they are a most remarkable group of skilled men working at one of the most demanding professions this world has ever developed . . . I am just a commercial pilot, too, bub, but I work at it.

ROBERT C. PHIPPS
East St. Louis, Ill.

On 'No Show' Penalties

To the Editor:

Comments appearing in AMERICAN AVIATION on the subjects of "No-Show Penalties" and "Scheduling" are of much interest to me.

Many of my trips are made with advance knowledge and reservations up to two and three weeks. Some are on the spur of the moment and on long trips there may be unforeseen changes in schedules. I do not like some of the penalties that are proposed. On the other hand, I appreciate the need for them.

I would gladly accept a percent penalty up to six hours before flight-time notification, and a greater penalty for no-show . . . up to 20 minutes before flight time. . . . This, of course, would not apply in the event of connecting flights and for one holding continuous passage which is in order to be given preference of any stand-by passengers.

On scheduling, I agree that most schedules are too tight. A head-wind, takeoff or landing delays, last minute confusion—a usual condition with some airlines—cause delays that often can't be made up. Allowances should be made. . . .

To prove a point, watch deplaning passengers: If the plane is late, note the sour expressions; if on time, smiles; if five minutes ahead of schedule, big smiles. Same applies to emplaning passengers. Note the look of anxiety when departure is delayed!

Name withheld by request
Dubuque, Iowa

Dispute 'Name Withheld'

To the Editor:

Just dragged myself in from the airyard from the first of my monthly DC-6 schedules. On the way in, I read the letter from "Name Withheld" (AMERICAN AVIATION Jan. 28. P.10) in regard to the pampered airline pilots.

Please have him advise the airline he was flying on during his eye-opening experience I'd like to get in line to be hired before some other pilots find out what a soft touch the East Coast flying really is.

Since "Withheld" has been flying since '42 and is undoubtedly a real hot sketch around the local airport coffee shop, the only reason I can think of that the airlines wouldn't hire him is his altogether negative personality.

My thanks to him for setting "us neurotics" straight.

P.S. He should shoot 200½ with the bus driver.

F/O C. L. DICKINSON
Redwood City, Calif.

To the Editor:

Attention "Name Withheld by Request": What's the matter, buster, wouldn't the airlines hire you with your 200 hours Cub time?

BARNEY HOLMES
Airline pilot.
Chicago, Ill.

Books

Elements of Gas Dynamics. *By H. W. Liepmann and A. Roshko. Published by John Wiley & Sons, Inc., New York 16, N. Y.* 439 pp. Price, $11.

In 1947 *Introduction to Aerodynamics of a Compressible Fluid* by H. W. Liepmann and A. E. Pucket was published and quickly became a standard. Since then, a vast amount of theory and data dealing with the behavior of gases became unclassified. With this release of data came expanded engineering applications of the theory. For this reason, Liepmann and A. Roshko decided to write this new volume, presenting the modern theory of the dynamics of bases. In a second volume they propose discussing the applications of this theory to the aircraft and missile fields.

W. B.

NEW TOUGH

S-T-R-E-T-C-H-E-D PLASTICS

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VISIBILITY

IN LOCKHEED'S NEW PROPJET ELECTRA

new Electra will be Swedlow's
new Stretched Acrylic plastic material.
It provides excellent visibility . . .
and its extra toughness assures
an extra factor of safety.

Naturally, we feel that Lockheed made a good choice. Other factors influencing Lockheed's decision were:

Highest quality of workmanship and service • Reliable delivery records • Technical expertness in formulating and fabricating plastics.

For complete information on the new Swedlow "Stretched Acrylics" and other Swedlow plastic products, we invite your inquiry on your company letterhead.

Ultra-modern Sky Lounge on the Lockheed Electra. High visibility provided by Swedlow "Stretched Acrylic" windows.

New Lockheed Electra—For short and medium range commercial transport. Payload 21,638 lbs. Cruising speed 405 m. p. h. Range 2700 miles, without touching reserve fuel. Can land at full load on 62% of nation's airports. 2400 ft. per min. climb. Operates to 30,000 ft. altitude. Wingspan 99 ft. Fuselage 104 ft. 6½ in. Tail height 32 ft. 1 in. Passenger capacity 66 to 21. Four 3750 H. P. Model 501 D-13 propjet engines. Full production in 1958

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engineering
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There's a wonderfully rewarding future for you at Boeing as an engineering test pilot. You'll be flying such famous airplanes as the 707, America's first jet airliner; the B-52 intercontinental jet bomber, and the KC-135, the nation's first jet transport-tanker. You'll be backed by the finest, most complete Flight Test Center in the industry. Boeing is expanding steadily so there'll be plenty of opportunities to move ahead.

If you have had broad flight experience, including time in multi-engine and jet aircraft and have an engineering degree, send your resume, including a complete flight-time record, to

John Sanders,
Engineering Personnel Administrator,
Boeing Airplane Company,
Seattle 24, Washington

BOEING

Production Spotlight

• Capt. Milburn G. Apt set a new speed record of 2,200 mph on the last fatal run of the Bell X-2. Consolidated Electrodynamics Corp., whose recording equipment gave some of the answers to the flight, says Capt. Apt was at 70,000 ft. when he set the record. At 45,000 ft., the plane was out of control, Capt. Apt fired the pilot's capsule from the aircraft. The plane landed belly first, but the airman was unable to free himself from the ejection capsule and was killed.

• The Martin Co. expects to fly the first production Navy P6M four-jet flying boat about the middle of summer. Crash of the two prototype SeaMasters has not seriously delayed production.

• Republic Aviation Corp. reports that more than 7,600 jets in the F-84 series have been built and now are flying with air forces of 13 countries. Accumulated flying time is estimated at 3.5 million to date.

• General Electric J47 turbojet now is operating 1,750 hours between overhauls. Pratt & Whitney's J57 is up to more than 800 hours.

• Hoffman Electronics is demonstrating a solar-energized flasher signal which the company hopes will interest airport operators. Company also has an air-sea rescue transmitter using converted solar energy. Converters are silicone units.

• Canadair has built approximately 1,600 F-86 Sabres to date, with production scheduled to continue through 1959. Fighters are powered by Orenda jets.

• Cubana Airlines has fitted its Super-G Constellations with RCA-built AVQ-10 airborne weather radar and will have radar factory-installed on next Super-G to be delivered.

• Several British manufacturers are working on a 600-mph jet transport for the British Commonwealth routes of BOAC. New specification replaces abandoned de Havilland DH 118 proposal. Latter would have been suitable for both North Atlantic and Commonwealth routes.

• Second Fokker F-27 Friendship turboprop transport has started flight tests. Its fuselage is three feet longer than first F-27 and is completely equipped for passenger use.

• Fokker's Brazilian subsidiary has delivered first 15 S-11 piston-engine trainers to the Brazilian Air Force. BAF has 100 on order.

• Fiat has designed a scaled-down version of its G.80 trainer to compete with the Macchi MB.326. Powerplane will be a de Havilland Goblin.

• Past thinking on building jet engines with shrouding to retain turbine blades in event of failures has taken an about-face. Reason: investigations with ballistics experts pointed to need for four to six inches of armor for adequate protection. Result is that civil requirements will spell out much higher safety factors in turbine blade design, and these not being present in a particular installation, the stringent armor-plating would have to be provided

• Employment in the aircraft and allied industries continues to lead the manufacturing field. There were more than 855,000 on payrolls of those industries at the start of 1957.

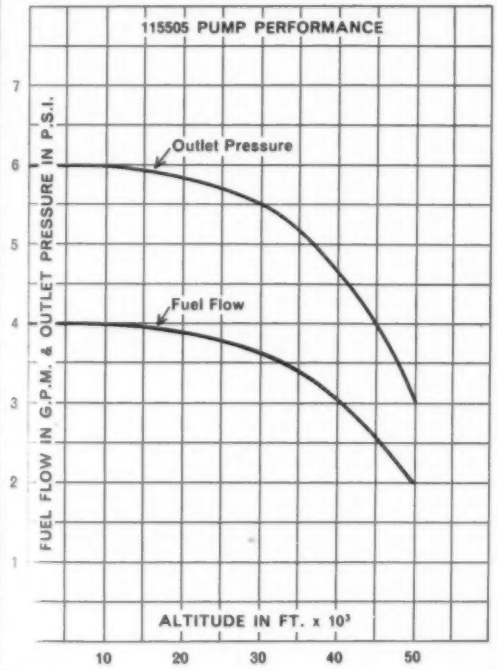
• Second model of the Pratt & Whitney J57 is now undergoing civil certification tests. Despite security limitations, company's J75 engine certification is not expected to be delayed and could possibly come in advance of foreign competitive engines such as Rolls-Royce Conway and RA.29 Avon.

• U.S. Coast and Geodetic Survey is weighing merits of procuring a new Fokker F-27 against borrowing a Lockheed C-130 from Air Force (on a no-cost basis). Study is understood to relate to operational economics of the two in charting and mapping service.

MIGHTY MITE

...that pumps up every last drop of fuel even at extreme altitudes!

P/N 115505 FUEL PUMP
112V 400 CYCLE SINGLE PHASE MOTOR JP-4 FUEL 60° F



To scavenge the fuel which would normally be trapped in the lower portions of the fuel tanks—that's the job of Whittaker's AC electric motor operated continuous duty fuel pump!

And this Whittaker Ratio-Flo pump does the job with half the weight and envelope of any other pump – and at extremely high altitudes!

The unit runs continuously after fuel level reaches a pre-determined point (a float switch turns the pump on).

Since entire motor and gear train are submerged, no shaft seals are required. Pump operates on very low current, and is capable of lifting fuel, pumping air and running dry for indefinite periods. Integral motor thermal protection is optional.

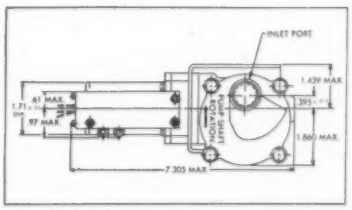
PERFORMANCE

TEMPERATURE. Ambient —65° + 216°F. Fluid —65° + 135°F.

ELECTRICAL POWER REQUIRED. 400 cycle 112V single phase alternating current.

SERVICE FLUID. Aircraft fuels (JP-4 and JP-5)

WEIGHT: 2.75 pounds. ENVELOPE: length, 6⅞ inches; height, 3¾ inches; width, 3⅛ inches.



This unit is now in production and suitable for use wherever a fuel scavenging problem exists.

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Gentlemen:

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PRACTICE MAKES PERFECT— In 1957, as in 1776, one measure of effective defense is the true aim and steady skill of a nation's fighting men. To make American warriors proficient against complex modern weapons, Northrop Aircraft's subsidiary, Radioplane Company, produces targets like the rocket-powered RP-70 type, a light, low-cost drone, which simulates a high speed modern jet plane or missile at stratospheric altitudes. Like Northrop's new supersonic Air Force trainer airplane and Snark SM-62 intercontinental guided missile, the RP-70 is another example of the Northrop-Radioplane policy of "*security with solvency*" which applies advanced science and technology to deliver the maximum in national defense for the minimum in tax dollars.

NORTHROP

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Builders of the First Intercontinental Guided Missile

Washington Report

Profits Again Under Fire

Hebert House Investigations Subcommittee will fire the opening gun this week in a broad new probe of military procurement activities. Service witnesses, alerted last week, will attempt to justify the yardsticks being used in negotiated contracts.

The procurement study, however, is merely the overture to an extensive investigation that will explore aircraft profits and costs of both engine and airframe manufacturers. Of special concern to the House probers this time will be activities of subcontractors. Manufacturers, who spent many hours before the subcommittee last session, can expect questionnaires in the mail soon.

Other targets of the probers will be USAF and Navy fixed-price incentive-type contracts and the alleged lack of uniform cost principles.

A revival of the problems of airstrip paving is hinted, too. The subcommittee is wondering about the engineering and economics of substituting concrete for flexible-type airstrip pavements. Although a formula was set in 1954, the probers contend it has been subsequently altered without formal hearings.

AF Feels R&D Squeeze

Air Force is caught in a tight squeeze on several R&D projects. With total program under close review, some curtailments are certain and manufacturers working on lower priority developments are getting uneasy.

Priorities must go: (1) to ballistics missiles, under White House orders; (2) to manned bombers, including chemical and nuclear projects; (3) to other missiles categories, and (4) to supersonic trainers. This will leave little money left for new transport projects.

There is much scurrying both in Pentagon and industry to offset the curtailments, with some confusing results:

- Authoritative reports that no funds would be available to proceed with a prototype of the Douglas C-132 were muddied by a Defense Dept. release saying it is being built at the Tulsa Division. At this time, no prototype funds are available or requested. AF spokesmen say the release was a mistake.
- Indications the Hiller X-18 tilt-wing research aircraft project (see page 36) would be canceled were quickly countered by joint release from ARDC and Hiller that a development contract had been let. However, the contract was let last fall before the new budget pinch.

Too Much Classification

Defense Dept. came in for some ribbing on its security policies at the annual Air Force Assn. Jet Age Conference in Washington.

Rep. John Moss, chairman of the House Subcommittee on Government Information, and John Hull, member of the Coolidge Committee, said any attempt to cover up on disagreements between services builds pressure from within to "leak" information and creates the impression Pentagon is attempting to conceal issues it can't solve.

Said Moss: "Too many Defense officials are brushing controversy under the rug of security . . . If the security process is being misused to muzzle viewpoints which conflict with the false facade of unanimity . . . the American people should know about it."

Hull charged Pentagon with the tendency to overclassify. "The Defense Dept. should cease attempts to do the impossible and stop classifying information which cannot be held secret. This includes information which cannot be withheld because it is inevitably known to too many people."

Resignations Deadline: March 15

White House has asked everyone who wants to leave the Administration and those for whom resignations have been requested on an if and when basis to have them in between March 5 and 15.

So the big era of change in top spots in the Administration will come after March 15. This most certainly will include a lot of assistant secretaries who want to get out.

Andrews Down—Burke to Go

Defense Dept., no doubt without top-level knowledge, has moved into a new role in the attempt by Civil Aeronautics Administration and airlines to get a second Washington, D. C., airport. Having successfully scuttled plans to handle overflow traffic at Andrews AFB, Defense now is supplying the key witnesses to overthrow the Burke (Va.) Airport plan. But even more significantly, in so doing, the Pentagon is supplying ammunition of such an explosive nature as to wreck its entire civil-military airport use program.

Unfortunately for Air Force, which has to face most of these problems, the witnesses come from the Army and Navy. Harold Stone, an Army engineer, told Sen. S. L. Holland's Senate Appropriations Subcommittee in great detail of the aircraft noise evils of airport community life to be heightened by coming jet age. But even more damaging were the comments of one Hugh P. Young, a Navy contracting officer whose qualifications appear virtually indisputable. Young handles Navy contract negotiations with municipalities throughout the U.S. on civil-military joint use airports.

Needless to say, the two Defense employes appeared at these key hearings in no way whatsoever representing the Army, Navy or Defense Department, but as private citizens. But the impact of their testimony on the Appropriations subcommittee, apparently already loaded with opposition in the persons of chairman Holland, Margaret Chase Smith, etc., could very well spell the end of Burke Airport or any other reasonable solution to the Washington traffic problem. More far reaching, however, would be the effect of Young's testimony if used against the military services almost anywhere they want to operate a jet in the U.S.

Postal Rate Increase Unlikely

Administration bid for higher postal rates has support of the House Appropriation Committee, but is not likely to get far in this Congress.

House committees, sharing alarm at the soaring Post Office deficit that will top half a billion dollars for fiscal 1958, urged increased postage.

Nevertheless, the full Congress probably will spurn the plea for higher rates, despite PO's reportedly elaborate program for improved services—including a plan to move all first-class mail by quickest means.

Seasoned congressional observers foresee a Senate move to bury the notion that Post Office should pay its own way. If such a policy is established, then the postage rate increase is a dead issue.

Industry News Digest

AF Plans 'Sharp' Changes This Year, But Quarles Keeps Them Under Cover

Mystery surrounding Air Force plans for the coming year was further heightened by Air Force Secretary Quarles when he alluded to "some expensive and sharp" changes that now seem "unavoidable." Speaking before the Air Force Assn. Jet Age Conference in Washington, Quarles failed to elaborate on what these changes will be.

He did, however, maintain that the fiscal 1958 $17.7-billion budget request would provide a "strong" program.

"It continues to build air power not as rapidly as some of us would like to see but at what I believe is a sound rate, everything considered." The $17.7 billion program, as outlined Quarles, provides for:

- Procurement of Convair B-58 supersonic bombers with the decision to order in quantity "contingent" on results of the current flight-test program.
- Procurement of Boeing KC-135 tankers on a ratio of two tankers to every three B-52's.
- Completion of B-52 procurement, with further B-52 and KC-135 procurement funds available from B-58 funds if the latter program is delayed.
- Continued high support for ballistic missiles projects, as well as continued support for other aircraft and missile programs. Only Century aircraft cited for the program were the F-100, F-102, F-104 and F-106.

Quarles emphasized the fact that his analysis of the budget is based on a number of "provisos," such as solving the problem of retaining technical manpower, maintenance of air/atomic deterrent power and keeping pace with Russia in the technological race. In a veiled reference interpreted as aimed at the expected publication of the Robertson report on shortening lead-time between development and production of new weapons, Quarles said:

"I would like to say that drawing board-to-inventory lead-time is not in itself a good measure of the effectiveness of development effort. The real question is not how long it takes to do the job but how good the job is in relation to the state of the art and, particularly, the state of the competitor's art when it reaches the operation stage."

He also warned that shortening development and production lead-time could prove more expensive in the long run by permitting only small-step improvements rather than less frequent but longer steps.

• **Just prior** to Quarles' statement that his defense of the budget was based on keeping pace with Russia in technology, Dr. Edward Teller, "father of the H-Bomb," startled the AFA audience by stating that in 10 years Russia will have the scientific leadership, instead of the U.S.

"I am not saying that if we do not take measures this will happen," Dr. Teller declared, "I am simply saying it is going to happen." He recommended measures to build up U.S. scientific strength (including higher salaries and more prestige), but noted that he was "not talking about keeping the lead—it's too late, but I am talking about recapturing it."

In another area of research and development, Louis Ridenour called for the "wide, prompt and effective" circulation of the U.S. military research and development program. He charged that progress has been "slowed" because of the secret classification of the material.

Ridenour, R&D director of Lockheed's missile division, maintained that a genuinely secret weapon in peacetime is "absolutely worthless." He condemned a policy of "security by classification" and asked for one of "security of achievement."

He maintained the only time security is needed on technical data is when it is inferior to that of the potential enemy. "If our total technical competence is greater than his, then in balance we shall hurt ourselves by suppressing the free publication of technical information."

Douglas C-132, Largest Cargo Transport, Unveiled by AF

Artist's concept of Douglas C-132 illustrates unprecedented dimensions of Air Force's largest cargo transport. Fuselage measures 187 ft.; swept-wing span, 178 ft.; cabin length, 95 ft.; width 17 ft.; height, 12.5 ft. Maximum payload is almost 200,000 pounds, top speed more than 460 mph. C-132 has four Pratt and Whitney T57 turboprop engines each developing 15,000 eshp.

Northrop Cancels Plan To Merge with Vertol

Northrop Aircraft, Inc. has withdrawn its proposal to merge with Vertol Aircraft Corp. and virtually closed the door on further steps to consummate four months of negotiations between the two firms.

Don R. Berlin, Vertol president, told stockholders that the Northrop action followed a meeting of the boards of the two firms January 16 to act on the agreement. At that time, Berlin said, only one of two prerequisites set by Northrop had been met, forcing further postponement of action.

The Vertol head said one of these prerequisites, involving an agreement on a voting trust for stock held by the Piasecki Aircraft Corp., had not been executed. The other, involving the interests of the Rockefeller family group in Vertol, had been signed, Berlin said.

Subsequently, he noted, conditions naturally changed, leading to the February 13 withdrawal by Northrop of its merger bid. The changing conditions referred to by Berlin are believed to involve a downward adjustment by the Army in its H-21 helicopter procurement for fiscal 1958, involving some 50 helicopters and $15 million in Vertol business.

Air Force in Market For New Interceptor

The Air Force is studying design proposals for a new medium-range interceptor and will sponsor a design competition for the aircraft, it has been learned.

Proposals are the result of an invitation issued by USAF to five companies last year, shortly after plans for the long-range interceptor competition were dropped.

Invitations went to Convair, North American, Northrop, Lockheed and Republic, and at least three (Convair, NAA and Republic) are known to have submitted design and feasibility studies.

A USAF spokesman said reduction in the Century series aircraft will not affect the decision to proceed with the competition. The new interceptor will be part of the modernization program to provide improved equipment.

Kaman Gets Contract For New Helicopter

Kaman Aircraft Corp. has received a Navy BuAer contract for an undisclosed quantity of a new single-rotor helicopter to be known as HU2 K-1.

The helicopter, to be powered by a General Electric T58 gas turbine engine, was one of two configurations Kaman entered in a Navy design competition for a utility craft. The company's present production helicopter, HOK-1 was winner of a 1950 Navy competition.

Supersonic Bomber Carries Disposable Load

First flight of Convair's B-58 Hustler with detachable capsule under fuselage confirms the supersonic bomber's use of the "disposable load" concept of strategic bombing, taking the place of internal bomb storage. B-58 also is slated to carry Fairchild Goose decoy missile fitted with corner reflectors to confuse enemy radar.

USAF Cancels Orders For Test Navahos

USAF has canceled orders for an undisclosed number of intermediate XSM-64 Navaho test vehicles and has applied the funds to production models of the SM-64 Navaho intercontinental missile.

The reshuffle was believed to have been caused by the tight squeeze on USAF research and development funds imposed by the Administration's fiscal 1958 budget. Rather than slow down the development cycle, USAF has decided to gamble on a shortcut that may provide it with a reliable weapon with a minimum of testing.

As a result of the move, North American Aviation will reduce work forces at both Downey and Los Angeles. Some of the personnel reduction will be accomplished by not hiring replacements for employes who terminate. Attempt will also be made to reassign employes who can qualify for openings in other divisions.

• **NAA also announced** that it will cut 450 employes from the payroll of its Columbus division by April 1 and that "more extensive reductions" are anticipated in late summer or early fall.

Cutbacks were blamed on recent completion of the F3J production program at Columbus, together with anticipated completion of the T-28 trainer and F-100D fighter programs later this year.

Only production program at Columbus scheduled to go on through the year is the FJ-4. The division is now tooling up for production of the Navy T2J jet trainer and A3J attack aircraft. Full production of these models is to be achieved in 1958. Efforts will be made during the model changeover period to hold lay-offs to a minimum through increased subcontracting and IRAN activity.

New Argentine Airline Orders 4 Convair 880s

Transcontinental, Argentine private-enterprise airline, has ordered four Convair 880s. It is the first foreign carrier to order the Convair jet. The $15-million contract brings total 880 sales to 44 aircraft.

Transcontinental has been authorized by the government to operate two long-distance international routes: Buenos Aires-Sao Paulo-Rio de Janeiro-Caracas-New York and Buenos Aires-Sao Paulo-Bogota or Mexico City-San Francisco.

CAA Gets Go-Ahead On High-Density Zones

Civil Aeronautics Board has revised Civil Air Regulations giving CAA the power to designate high-density air traffic zones at key areas in the U.S. and to limit aircraft speeds to 180 mph within them.

The new rules, effective March 15, also would require radio-equipped aircraft to communicate with ATC facilities before operating to or from airports with high-density zones. Aircraft without communication equipment would be permitted to fly in the zones only with prior control tower permission.

In other changes, CAB ruled that pilots of flights operating under VFR conditions will not be permitted to take off or land at airports in such zones when visibility is less than one mile. However, under special circumstances (such as heavy smoke conditions), CAA will be permitted to lower this limit to one-half mile.

W. R. Grace Again Asks CAB to Grant New Route Privileges for Panagra

W. R. Grace & Co. has asked CAB to grant Pan American-Grace Airways new routes to Miami, Washington and New York, and to Mexico City and Los Angeles/San Francisco.

Grace and Pan American World Airways are 50-50 owners of Panagra. Grace charged PAA with "fraud and illegality" by virtue of its "consistent opposition" to Grace proposals for new routes for Panagra. It sought to have CAB consider the route applications as applications of Panagra.

PAA immediately criticized Grace, stating that "the application . . . is simply the latest in a nearly 30-year series of attempts by the Grace steamship interests to repudiate contracts . . . approved by the CAB in 1947 and again in 1955."

The development ended an apparent "truce" that has existed between Panagra's owners since a Justice Dept. anti-trust suit was filed in January, 1955, to break up their joint ownership. Also, it appeared the possibility of settlement of the suit may have disintegrated.

• **Grace revealed** that last November Panagra's management had made a route proposal to the airline's board of directors. The proposal was based on an "extensive route study" and a resulting report which stated that "Panagra's situation is a desperate one . . . (and) . . . the only logical solution is the extension of Panagra's routes to markets which will share the fixed overhead expenses and permit profitable load factors."

The proposal failed to pass because PAA's four directors on Panagra's board voted against it, Grace said. Thus, it added, PAA, "in combination and conspiracy with the directors nominated by it on Panagra's board . . . has exercised and continues to exercise its control over Panagra for the benefit, profit and advantage of its 100%-owned operations to the damage and detriment of Panagra."

Panagra's routes extend south from Balboa. It operates from Balboa to Miami under a "through flight agreement" of 1946 under which PAA grants trackage rights. It is also a party to a New York-Miami-South America interchange with PAA and National.

Grace said the interchange, which it asserted was forced by a CAB ultimatum, is financially detrimental to Panagra, and that the airline's reputation and good will are suffering from "the National operation of the interchange."

CAB Revamps Procedure For Accident Hearings

Civil Aeronautics Board this week will introduce major revisions to its 15-year-old processes of conducting accident investigation hearings, including allowance for the direct questioning of witnesses by other than CAB panel members.

On February 27, When CAB's inquiry panel begins hearings into the January 6 crash of an American Airlines Convair 240 near Tulsa, Okla., formal hearing will be preceded by a newly established prehearing conference. Purpose of this session will be to limit and define the issues and set the scope of the hearing.

New Board practices also call for participation by officially designated "parties to the investigation," a group that will include persons, government agencies, companies and associations whose employes, functions, activities or products were involved in the accident, or who participated in its investigation.

These "so-called" parties to the investigation will be given the authority for direct questioning of witnesses during the hearing.

CAB plans to institute the procedure in the AA accident hearing and to use it at hearings into the February 1 crash of Northeast Airlines' DC-6A near LaGuardia Field, N.Y. and the West Coast collision of a Northrop F-89 and Douglas DC-7 on test flights.

TWA to Introduce 1649A Service July 1

Trans World Airlines has announced plans for simultaneous introduction of its Lockheed 1649As into both domestic and overseas service on July 1. At the same time, TWA revealed the new aircraft will be designated "Jetstream Starliners."

First domestic service will involve transcontinental nonstop operation at first-class fares. In overseas service, the 1649A initially will be used in tourist-class nonstop flights between New York, Paris and London.

First Closeup View of Bell GAM-63 Rascal

Closeup view of Bell Aircraft's Rascal bombardment missile. GAM-63 is a long-range, rocket-powered air-to-surface guided missile that has been launched in tests from B-47, B-36 and B-50. Bell has been working on AF missile since 1946, has complete weapon systems responsibility.

Airlines Adopt System Of Filing Flight Plans

U.S. scheduled airlines, in a move to reduce the mid-air collision hazard, have instituted an industry-wide practice of filing instrument flight plans for operations at 18,000 ft. and above.

The new practice, recommended to carriers by the Air Transport Assn., will provide airline flights with guaranteed ATC separation from each other, but not necessarily from military or private aircraft flying VFR at these altitudes.

The airline move, which obviously will increase CAA workload at air route traffic control centers, was fully coordinated with CAA before adoption and has its full support, CAA officials told AMERICAN AVIATION.

They indicated, however, that they were unable to estimate just how much an increase in workload would be involved.

Three Foreign Airlines Order More Aircraft

Orders for new U.S. and British turboprop and piston-engine transports have been announced by three foreign airlines.

Icelandic Airlines Loftleider has completed arrangements to buy two Lockheed Electra turboprops, with deliveries scheduled for late 1959 and early 1960. Reported price is about $4,633,600, of which 30% will be paid before delivery and the balance financed through the Export-Import Bank. The airline operates to the U.S. and Europe and will start daily U.S.-Iceland-Europe flights in May.

Lufthansa, the German airline, ordered three more Convair 440 Metropolitans and two more Viscount 810Ds. The company had previously ordered two 440s and seven Viscounts.

Loide Aereo, Brazilian carrier, bought four DC-6Cs. Loide, a domestic operator, has a fleet of about 20 C-46s.

R. L. Turner to Join Air Traffic Conference

Robert L. Turner, who resigned last month as vice president-sales of Northeast Airlines, will join the Air Transport Association on March 4 to head Air Traffic Conference activities.

It is expected he will be elected vice president-traffic of ATA, a position that has been vacant since the death of Charles Hubbard several years ago. Frank Macklin remains as assistant v.p.-traffic of ATA and executive secretary of ATC.

Adams Named Aide By Monroney Committee

Former CAB Member Joseph Adams has joined Sen. A. S. Mike Monroney's Aviation Subcommittee as a consultant. The Oklahoma Democrat said Adams will take over a study of the adequacy of CAA's aircraft inspection service.

Adams said he will serve on a part-time consultant basis. Although he plans to open his own Washington law office, he said he is ready to take on "any assigned task" from the subcommittee. He expects to share space in the Senate group's offices.

U.S. Air Services Magazine Discontinues Publication

U.S. Air Services, oldest monthly aviation magazine in the U.S., discontinued publication with the January issue. The magazine was edited and published in Washington from the end of World War I by Earl Findley, who died last year.

Florence Bergstrom, Findley's assistant since 1919, continued the magazine for a time but decided to close shop when some old-time advertisers decided to drop out. The subscription list had declined considerably in the past six months.

Clinton Davidson Dead

Clinton Davidson, Jr., 45, board chairman of Resort Airlines, died of a heart attack in Washington on Feb. 13. In 1953 Davidson became chairman of Resort Airlines of North Carolina, the operating company, and president of Resort Airlines of Delaware. He had served as treasurer of both companies since 1955 and as chief executive officer of the operating company. Resort is a large military contract carrier.

News Briefs

MANUFACTURING-MILITARY

• **Piper Aircraft Co.** will begin immediate construction of the Piper Aircraft Development Center at Vero Beach Municipal Airport, Fla. Structure will be devoted to design, construction and test flight of prototypes, with eventual establishment of a complete production facility.

• **General Dynamics Corp.'s** 1956 sales topped $1 billion for the first time (1955 total was $687,300,000). Current backlog is about $2 billion.

• **Pratt & Whitney Aircraft's** nuclear engine program has been established as a separate operation of United Aircraft's engine building division and will occupy USAF-sponsored facilities in Middletown, Conn., this summer.

• **General Electric Co.** received a $53,414,557 USAF contract for J79 engines. Aircraft in which the powerplants will be installed was not disclosed.

• **Ryan Aeronautical Co.** received one Navy and two USAF contracts totaling $5,250,000 for production of the Firebee jet target drone. Meanwhile, Continental Aviation & Engineering Corp. announced that a Ryan XQ-2B target drone powered by a Continental J69-T-19A jet engine reached an altitude of 53,500 ft. on a test flight at Holloman AFB, N.M.

• **Airborne Instruments Laboratory,** Mineola, N.Y., and Aircraft Radio Corp., Boonton, N.J., reached substantial agreement on general terms of a statutory merger that will be recommended to stockholders.

• **Bell Aircraft Corp.** acquired its sixth wholly-owned subsidiary, Lake Erie Engineering Corp., Buffalo, N.Y. Company designs and builds hydraulic and extrusion presses, die casting machines, printing and stereotype equipment.

• **Wickfield Aviation Inc.** has been formed with offices at 1511 Levee St., Dallas, Tex. Firm will engage in airframe and tool design, research, development and testing, using specialized electronic, structures, metallurgical and chemical laboratories. Initial contract has been signed with Temco. Bert Fields is board chairman and H. L. Wichman, former assistant secretary of McDonnell Aircraft Corp., is president.

TRANSPORT

• **Braniff Airways** reported net profit of $1,885,799 for 1956, up 13% over 1955. Operating revenues rose 12.7%, expenses 11.5%, revenue ton-miles 15.5% and available ton-miles 16.45%. Revenues on company's new route to New York exceeded all additional expenses and made a realistic contribution to overhead, president Charles E. Beard said.

• **TWA** and Air Line Pilots Association signed an 18-month contract which a union spokesman said incorporates "definite forward steps" in the airline industry. The "forward steps" were said to include compensation for excessive lay-over time, compensation for briefing and en route ground time at intermediate stations, and earlier check-out of co-pilots.

• **R. D. Hager** has resigned as vice president-traffic and assistant to the president of Piedmont Airlines.

• **Northwest Airlines** has arranged a bank credit agreement providing maximum credit of $38.5 million at interest of 4¼%. Money will be used to help finance the 14 DC-7Cs and 10 DC-6Bs on order, costing $55 million. NWA will also sell its four Super-G Constellations and some DC-4s to help pay for the new equipment.

• **TWA asked CAB** to extend its $80 transcontinental coach excursion fare through Sept. 15. The tariff, first effective in September, 1955, has been extended at six-month intervals since.

• **National Airlines** and International Association of Machinists signed a one-year contract, ending a strike threat. Some 1,200 IAM members get pay boosts ranging from 13¢ to 21¢, retroactive to Oct. 1.

• **Slick Airways** reported that it carried 49,455,000 revenue ton-miles of cargo in common carriage in 1956.

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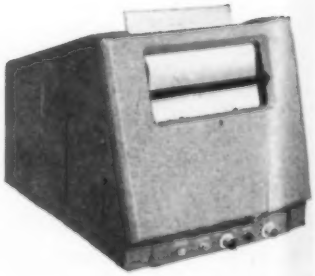

STEWART SW WARNER **ELECTRONICS**

a Division of Stewart-Warner Corporation

TOP ADMINISTRATION OFFICIALS, possibly armed with new intelligence estimates of Soviet aircraft performance, are declaring flatly that U.S. planes are better than Russia's. USAF Secretary Donald Quarles has said that the B-52 is unquestionably better than the Soviet Bison heavy jet bomber. He cast doubt on claims that it was rushed into operation in four or five years, compared with eight years for the B-52.

Dr. Clifford Furnas, Assistant Defense Secretary for R&D, said U.S. planes generally outperform Russian aircraft and he indicated U.S. is also ahead in ballistic missiles.

•

AIRCRAFT INDUSTRY LAYOFFS are beginning to assume serious proportions. On top of severe cutbacks anticipated by North American at Columbus (p. 23), NAA will drop about 300 employes as result of Nahavo adjustment, Westinghouse is cutting off 500-600 at Kansas City, Republic is terminating 4,000 at Long Island plants.

Sudden announcement of these cuts coincides with start of detailed congressional hearings on military's 1958 budget requests. They illustrate pinch on military procurement and development funds, even if not direct result of the squeeze.

Most of cutbacks had been expected; they result from completion of production of older aircraft. But as military deliveries continue to dwindle, more layoffs may be expected. This could spark whole new round of criticism of Administration's airpower program.

•

B-52 ACCIDENT EXPERIENCE is not evidence of a defective weapon system, USAF has concluded. It has told Congress that the Stratofortress is its proven primary striking weapon. B-52 safety record compares favorably with the earlier B-36 and B-47, based on an equal number of flying hours.

Chairmen of Senate and House Armed Services committees have received USAF's analysis of four B-52 crackups since Feb. 16, 1956. Report stresses that USAF is implementing a number of suggested improvements proposed by a special 53-man accident investigation committee.

•

CONGRESS STILL keeps the heat on to get more defense business for small firms. Senate Small Business Committee says too many contracts are going to big corporations. It wants Defense Dept. to start a "crash" program to channel more work—particularly research and development items—to small plants. Congress also passed and the President signed a bill raising Small Business Administration's business loan authority. Original act limited loans to $150 million. This is now boosted to $230 million.

The Army, doubtless reflecting the attitude of the other military services, made its position clear on small business. Brig. Gen. Chester de Gavre, director of development, said Army welcomes ideas from small aircraft firms but can't be expected to provide them with production facilities if their ideas are successful. He added: "Our policy is, if there is a perfectly good government-built aircraft factory standing idle, why not use it?"

B. F. Goodrich brakes, wheels and tires selected by Temco for new jet trainer

In designing the new TT-1 primary jet trainer for the Navy, Temco engineers asked for a high capacity brake that would take the punishment of a trainer's high landing frequency. And they wanted wheels and tires that would stand up to the strain when student pilots make "six landings to the approach".

For these reasons they selected a complete B. F. Goodrich package, wheels, brakes and tires. Dynamometer and actual flight tests prove that B. F. Goodrich disc-type brakes have greater capacity for fast, chatter-free stops than any brakes on the market today.

Full 360° sintered metal linings give longer brake life and better ground control. An automatic 2-way adjuster maintains constant lining clearance regardless of service wear, eliminates periodic manual adjustment and assures that the brake will always react the same way to pedal pressure.

B. F. Goodrich brakes, wheels and tires combine unusual strength with minimum weight. These features give the country's newest military training plane added safety for take-off, landing and for ground control, too.

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ESTABLISHED JUNE 1, 1937

World's Largest Aviation Publishers
American Aviation

VOL. 20 No. 20

TOO MUCH NOISE ABOUT NOISE

Facts Belie Wild Charges of Jet Deafness

Veterans Administration figures show most of $54 million paid out for all hearing damage cases was for disabilities incurred in pre-jet era.

By LOIS C. PHILMUS

PRIME example of misunderstanding, hysteria and outright misrepresentation is the subject of "jet noise and extent of its damage to man's hearing."

The very newness of the phenomenon has made the public gullible to sensational stories and politically motivated statements. This irresponsible propaganda is resulting in costly and irrelevant law suits, unjust criticism of the military and industry, and in obscuring new facts on the subject as they are released.

Most recent sensationalized charge was that jet noise was chiefly responsible for the Veterans Administration paying out about $54 million annually in benefits for hearing loss and diseases of the ear. Widely publicized in the press and the subject of a "view with alarm" speech on the floor of Congress, interpretation of the figure is completely erroneous.

Here are the facts:

• VA pays out an estimated annual total of $54,480,000 to more than 98,000 veterans with hearing losses or ear diseases. However, the benefits go to veterans of World War I, World War II and possibly even the Spanish-American War, with a small percentage to Korean veterans.

• Majority are pre-Korean veterans. Therefore a very small number have had a chance to be exposed to jet aircraft. Further, the Air Force—primary operator of jet aircraft—would account for only about 35% of total benefits paid, with Navy and Army representing the balance.

The factual story is that the military has had no way of gauging whether a hearing disability is actually service-connected or not. Actually, it has been estimated that there is 15 times as much hearing loss from artillery as from jet noise. Other hearing losses can be sustained in the natural ageing of man, and from illnesses and other possible causes.

• **Public Law 144** presumes an individual to be sound unless at the time of a physical examination a notation is made that he is unsound. It further specifies that a veteran will be eligible for benefits for hearing losses for one year after leaving the service. Therefore, if his hearing was found to be "normal" on his discharge, but a loss was noted up to 12 months later, benefits are paid.

Breakdown of the VA payments shows that about $42 million has been paid annually to about 70,000 for hearing losses from consideration of time spent in the service; $12 million to about 28,000 for diseases of the ear and about $480,000 paid to 560 individuals for progressive ear diseases.

The $54 million figure was first used by Dr. Kenneth O. Johnson, formerly with the Veterans Administration, before a meeting of the Armed Services committee of the National Research Council meeting on hearing and biocoustics in October, 1955.

He used the figure to press the importance for implementing a regulation requiring that audiometric hearing tests be made mandatory for all military services. His reason: there was no way of telling whether personnel had sustained hearing losses from service occupations, diseases, ageing or any number of factors having no relation to service. At no time was the assumption made that the losses were sustained from jets—actually, it can only be proven that little or no jet-induced losses are the cause of the benefits collected. Recently, however, new publicity was given to Dr. Johnson's total figure, with an interpretation indicating that jet noise was a major cause.

Greater progress is being made in protecting personnel from the effects of jet noise than from any previous damaging noise. A mandatory "hearing conservation program" has been in effect in the Air Force since last October, but precautions have been under way since 1946.

Airframe manufacturers have been taking precautionary measures to protect personnel since World War II. The key to the new program is the mandatory regulation that all personnel will have an initial audiogram—the most accurate measurement of hearing normalcy available today.

The problem has been generally known for some time, according to Dr. Horace O. Parrack, technical director and coordinator of the research and development program on AF noise and vibration control, and there is widening recognition of its significance.

Techniques and equipment for

AIA Facts and Figures on Jet Noise

Here are some figures compiled by Aircraft Industries Assn. from Veteran Administration figures relating to compensation paid for loss of hearing and ear disease:

• About 12,000 of the more than 90,000 veterans receiving such pensions suffered disabilities from non-service causes.

• About 72,000 are veterans of World Wars I and II—before jets came into service.

• About 7,300 Korean conflict and 3,500 peacetime veterans are service-connected cases.

AIA makes these further observations:

• Air Force states it does not know of a single case of total deafness attributable solely to jet noise. "Air Force doctors further state that the number of persons being discharged from the Air Force for hearing disabilities is infinitesimal and has shown no rise during the past seven years."

• USAF medical officials say that residents living near Air Force installations have nothing to fear with regard to hearing defects resulting from aircraft noise. "Constant effort is being exerted . . . to reduce and suppress noise. Progress continues on mufflers, suppressors and personal protective equipment (for those working near jets)."

measuring and protecting personnel have been available and widely used. Main difference now is that it is absolutely mandatory for personnel generally. He labeled "a major advance" the October regulation which makes it mandatory for military and civilian personnel to have an audiogram both when entering the Air Force and when leaving.

Previously, the only methods of ascertaining the presence of normal or subnormal hearing capability have been "crude" at best. The initial audiogram, the expert explained, accurately measures hearing capability. Factors of ageing—known to weaken hearing as it disturbs vision—must be considered along with effects of diseases and medicines taken through the years which might have adverse effects.

Without such a record, Dr. Parrack said, no one can contradict any of the veterans' claims now made. The audiogram is further essential because it is equally important to the Air Force to maintain maximum efficiency.

What Program Provides

The mandatory hearing conservation program calls for:

• Initial audiogram to measure hearing capability of personnel prior to assignment where the individual may incur hazardous noise exposure figured on a formula of noise levels with time exposed.

• Personnel assigned to such areas, i.e., jet maintenance, flight lines, etc., are given a second audiogram in 90 days. If no change is noted, audiograms are taken annually. If change does occur, personnel is informed of the change, given special protective equipment and checked again within a 30-to-90-day period.

The regulation provides further that personnel either classified by area of duty evaluated as hazardous or by job assignment—such as jet mechanic —will be: (1) fully informed about audiometric monitor; (2) provided with protective equipment; (3) informed of protective methods; and (4) action will be taken to reduce area noise hazards with suppressors.

The regulation "recommends" protection when exposed to an 85-db noise level in an eight-hour day and makes it mandatory at 95 dbs. Ear plugs, developed as early as 1940, have been highly perfected. But more recently the "ear muff" has been developed which provides better protection. In rare cases of high exposure, both plug and muff are to be used.

• **Dr. Parrack,** considered one of the nation's top experts in the acoustic sciences, unequivocally stated that there is "no environment known today where protection cannot be provided." The same concepts for hearing conservation in the jet age have been applied by the Army and Navy and most aircraft manufacturers, with industry showing a very enlightened attitude, he said.

Referring to the misrepresentation of the VA statistics, Dr. Parrack commented: "25% of the total male population has a natural hearing loss of 4,000 cycles regardless of any noise exposure. In reality, veterans should not be compensated for diseases. In the majority of cases, causes of loss are completely unknown."

The mandatory audiogram will provide the first accurate yardstick for measuring and evaluating hearing losses and to allow an analysis of their cause. Dr. Parrack hopes eventually to give audiogram tests to all military and civilian personnel, regardless of assignment. Tests would be made a matter of permanent record and would provide the first documented and basic research in the "unknowns" of the hearing ability of human beings. ◆◆◆

Congress Gets New Aviation Bills

Sen. Spessard Holland (D-Fla.) introduced a bill designed to step up handling of claims against the government for damage caused by military planes or missiles. The legislation would permit the secretary of each military service to pay authorized claims not exceeding $50,000.

The current law allows claims not over $1,000 to be settled administratively. A similar bill (H.R. 4669) has been introduced in the House by Rep. B. F. Sisk (D-Calif.).

Legislation that would authorize permanent certification for carriers flying between Alaska and the United States has been proposed by Rep. Joseph P. O'Hara (R-Minn.). The bill (H.R. 4520) was referred to the Interstate Commerce Committee.

Other recent legislative proposals:

• H.R. 4275, by Rep. Oren Harris (D-Ark.) calling for establishment of an Office of Civil Aviation Medicine.

• S. 917 by Sen. Olin Johnston (D-S.C.) which would restore the Postmaster General's authority to adjust postage rates for airmail weighing over eight ounces.

• H.R. 4305 by Rep. D. S. Saund (D-Calif.) to recognize the Ryan-Hemet Airport as a public airport for the purpose of the Federal Airport Act, and to provide for reimbursement for damage to the airport.

• H.R. 4389 by Rep. Charles S. Gubser (R-Calif.), calling for amendment of the Civil Service Retirement Act to provide retirement benefits for certain employes involved in operating and testing aircraft.

• S. 1025 by Sen. Warren Magnuson (D-Wash.) aimed at amending the Air Commerce Act to authorize the sale of goods and services by any department or independent establishment to the owner of an aircraft in an emergency and for other purposes. A similar bill is pending in the House.

• H.R. 4124 by Rep. Henry Reuss (D-Wis.) calling for relief against discrimination in interstate transportation.

• H.R. 3982 by Rep. Dewitt S. Hyde (R-Md.) to repeal the tax on transportation of persons and property and H.R. 4113 by Rep. Thaddeus Machrowicz (D-Mich.) calling for repeal of the transportation tax.

• H.R. 4091 by Rep. Daniel A. Reed (R-N.Y.) to provide a one-year extension of the existing corporate normal-tax and certain excise taxes.

Lockheed's New Two-Seater F-104B Starfighter

Dual-purpose Lockheed F-104B has made its first flight. Two-seater Starfighter can be used either as dual-cockpit tactical fighter or combat-proficiency trainer. It has same powerplant (GE J79), armament and over-all dimensions as single-seat F-104A.

CAA Predicts 118 Million Passengers by 1970

By WALLACE I. LONGSTRETH

Flying, for business or pleasure, is expected to show tremendous gains during the next 13 years, according to forecasts recently released by the Civil Aeronautics Administration.

As the CAA's program Planning Office sees it in a report titled, *1960-1965-1970 Civil Aviation and Federal Airways Forecasts:*

- U.S. domestic airlines by 1970 will sell 100 to 118 million passengers somewhere between 52 and 68 billion miles of air transportation. At the same time, U.S. airline customers will be buying from 1.2 to 2.0 million ton-miles of transportation for air express and air freight shipments.
- U.S. international and overseas airlines will haul 11.5 million passengers 15.5 billion revenue passenger-miles in 1970.

And general aviation activity, which includes all flying done by civil aircraft except that of air carriers, will operate 107,875 aircraft 19.1 million hours.

The forecasts, detailed in the accompanying tables, see greater activity in all phases of flying than was seen in the previous study of August, 1955. In all cases it is assumed that the American economy will continue in a state of vigorous expansion, that Defense Department expenditures will continue at a high level, but that there will be no all-out mobilization despite continuing international tension.

When centering its attention on domestic air commerce, many growth factors were considered. In one instance the survey notes: "The prospects for a further downtrend in over-all airline fare levels are considered excellent. This should partly result from the further extension of coach service which will dilute average passenger yields . . ."

The comment goes on to note that nearly every new aircraft placed in service has been more efficient than its predecessors. Trunk-line unit costs declined from 32.3 cents per available ton-mile in 1946 to 26.1 cents in 1955.

- **Travel habits** are expected to change as more and more people will try flying for the first time and find that it has marked advantages. Those who insist that they "never will fly" will gradually move out of the travel market and be replaced by a more air-minded generation.

The introduction of jet and turboprop aircraft will appreciably widen the speed and time advantage enjoyed by air transportation over surface carriers, particularly for long distance travel.

"When combined with the expected downward trend in airline fares, better schedules and increased public acceptance of air travel . . . it may

Domestic Airline Passenger Traffic and Percent Change

(1946-1970)

Calendar Year	Revenue Passengers (in millions)			Revenue Passenger-Miles (in billions)		
		Annual change			Annual change	
	Number	Number	Percent	Number	Number	Percent
1946	12.2	.....	.....	5.9	.....	.....
1947	12.9	0.7	5.7	6.1	0.2	3.4
1948	13.2	0.3	2.3	6.0	—0.1	—1.6
1949	15.1	1.9	14.4	6.8	0.8	13.3
1950	17.3	2.2	14.6	8.0	1.2	17.6
1951	22.7	5.4	31.2	10.6	2.6	32.5
1952	25.0	2.3	10.1	12.5	1.9	17.9
1953	28.7	3.7	14.8	14.8	2.3	18.4
1954	32.3	3.6	12.5	16.8	2.0	13.5
1955	38.0	5.7	17.4	19.8	3.0	18.1
1956 (prelim.)	41.9	3.9	10.0	22.4	2.6	13.1
1960 (est.)						
Low	60.0	.....	.....	32.0	.....	.....
Inter.	66.0	.....	.....	35.0	.....	.....
High	72.0	.....	.....	38.0	.....	.....
1965 (est.)						
Low	80.0	.....	.....	42.0	.....	.....
Inter.	93.0	.....	.....	49.0	.....	.....
High	106.0	.....	.....	56.0	.....	.....
1970 (est.)						
Low	100.0	.....	.....	52.0	.....	.....
Inter.	118.0	.....	.....	60.0	.....	.....
High	136.0	.....	.....	68.0	.....	.....

SOURCE: 1946-1955 data from Office of Carrier Accounts and Statistics, CAB. 1960, 1965 and 1970 estimated by CAA Program Planning Office.

International and Overseas Airline Passenger Traffic

(1946-1970)

Calendar Year	Revenue Passengers (in millions)			Revenue Passengers-Miles (in billions)			Passengers Emplaned at Cont. U.S. Stations (in millions)
		Annual change			Annual change		
	Number	Number	Percent	Number	Number	Percent	
1946	1.0	.....	.....	1.1	.....	.....	.....
1947	1.4	0.4	40.0	1.8	0.7	63.6	.....
1948	1.4	.....	.....	1.9	0.1	5.6	0.4
1949	1.5	0.1	7.1	2.1	0.2	10.5	0.4
1950	1.7	0.2	13.3	2.2	0.1	4.8	0.5
1951	2.0	0.3	17.6	2.6	0.4	18.2	0.7
1952	2.4	0.4	20.0	3.0	0.4	15.4	0.8
1953	2.7	0.3	12.5	3.4	0.4	13.3	0.8
1954	2.8	0.1	3.7	3.7	0.3	8.8	0.9
1955	3.4	0.6	21.4	4.4	0.7	18.9	1.0
1956 (prelim.)	4.0	0.6	17.6	5.1	0.7	15.9	1.2
1960 (est.)							
Low	4.8	.....	.....	6.3	.....	.....	1.5
Inter.	6.2	.....	.....	8.0	.....	.....	1.9
High	6.8	.....	.....	8.8	.....	.....	2.1
1965 (est.)							
Low	6.1	.....	.....	8.2	.....	.....	1.9
Inter.	8.9	.....	.....	12.0	.....	.....	2.7
High	11.5	.....	.....	15.5	.....	.....	3.5
1970 (est.)							
Low	7.6	.....	.....	10.2	.....	.....	2.3
Inter.	11.5	.....	.....	15.5	.....	.....	3.5
High	14.8	.....	.....	20.0	.....	.....	4.5

SOURCE: 1946-1955 revenue passengers and passenger-miles data from Office of Carrier Accounts and Statistics, CAB emplaned passengers from CAA, Air Commerce Traffic Pattern. 1960, 1965 and 1970 estimated by CAA Program Planning Office.

be anticipated that by the end of the forecast period the airlines will be carrying nearly all intercity common carrier passengers making trips over 500 miles."

Airlines ability to penetrate the short-haul intercity market will have a pronounced effect, but will in a great measure be dependent on the development of new aircraft, location of close-in fields, and the possibility that better access roads or monorails will tie airports to metropolitan centers.

Air cargo, the agency found, is still on "infant" industry "whose major period of growth is before it."

In dealing with air cargo developments, the forecasters assumed that the difference between surface and air freight rates will continue to shrink, and that air freight unit costs go down as more efficient aircraft, such as the DC-6A and the 1049H, replace C-54s and C-46s.

The outlook for any substantial reduction in air freight rates in the near future appeared dim to the agency, and the possibility of rate cuts in the 1960s seemed to depend on the development of new cargo aircraft, possibly a commercial version of the C-130, C-132 or C-133, which are being built for the military.

The principal factor that will produce air cargo growth is the very favorable economic climate.

International and overseas air traffic will profit from the economic climate which will provide more people with more vacation time and more money. Fare reductions are already scheduled which will broaden the base of international air travel to include "the vast and growing middle income groups in the U.S. which hitherto have largely considered overseas travel beyond their means."

In pinning down estimates for general aviation activity, the CAA again recognizes the dynamic state of the American economy. Most of the statistics peculiar to this segment were taken from annual CAA aircraft use surveys, and these were bolstered by information from aircraft manufacturers and operators.

In the report, General Aviation is divided into four categories—business flying, commercial flying, pleasure flying and instructional flying.

Business flying is defined as the flying done by corporations, companies, or individuals in carrying out in their own aircraft the operation of their given enterprises or professions.

Commercial flying includes crop dusting, patrol flying, survey and advertising flying, and cargo and passenger transportation for hire.

The survey notes that business flying has been the most rapidly growing segment of general aviation, and it now accounts for almost half of all general aviation hours logged during the year. ◆◆◆

Domestic Civil Air Cargo[1] Ton-miles and Percent Change

(1946-1970)

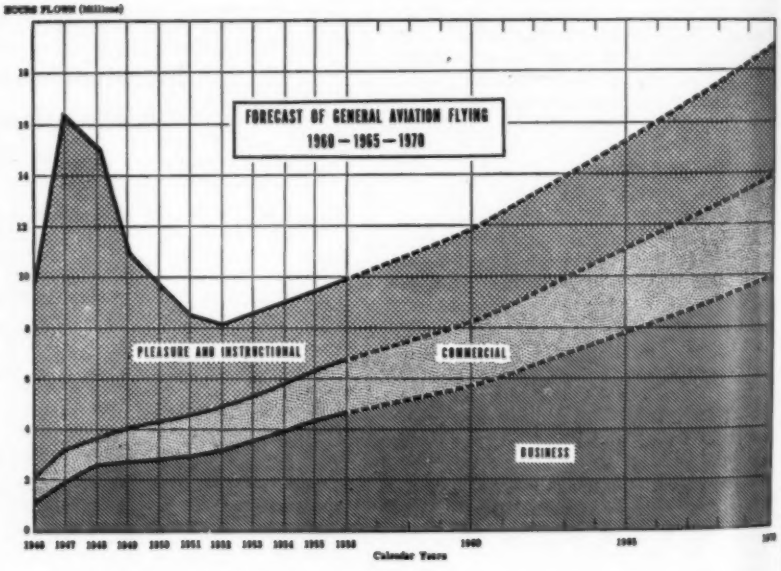
(Ton-miles in thousands)

Calendar Year	Total Ton-Miles	Scheduled Combination Carriers		All-Cargo Carriers		Large Irregular Carriers[2]	
		Ton-Miles	% Change	Ton-Miles	% Change	Ton-Miles	% Change
1946	82,593	42,593	.....	19,460	.....	20,540	.....
1947	127,959	67,959	59.6	28,856	48.3	31,144	51.6
1948	150,767	100,996	48.6	38,567	33.7	11,204	—64.0
1949	174,481	123,677	22.5	37,634	— 2.4	13,170	17.5
1950	229,039	152,327	23.2	63,599	69.0	13,113	— 0.4
1951	239,310	144,188	— 5.3	79,056	24.3	16,066	22.5
1952	260,477	159,514	10.6	86,447	9.3	14,516	— 9.6
1953	261,576	176,428	10.6	81,330	— 5.9	3,818	.....
1954	252,366	186,615	5.8	62,295	—23.4	3,456	— 9.5
1955	332,258	226,425	21.3	100,882	61.9	4,951	43.3
1956 (prelim.)	380,000	239,000	5.6	136,000	34.8	5,000	1.0
1960 (est.)							
Low	500,000						
Inter.	600,000						
High	700,000						
1965 (est.)							
Low	800,000						
Inter.	1,000,000						
High	1,200,000						
1970 (est.)							
Low	1,200,000						
Inter.	1,600,000						
High	2,000,000						

[1] *Express and freight carried by scheduled combination carriers; freight only for all-cargo and large irregular carriers.*

[2] *1946-1952 data include military contract business as it cannot be separated from civil. 1953, 1954 and 1955 cargo ton-miles for the large irregular carriers should not be compared with prior years.*

SOURCE: 1946-1955 information developed by CAA from data obtained from the Office of Carrier Accounts and Statistics, CAB. 1960, 1965 and 1970 estimated by CAA Program Planning Office.



Senate Confirms Pyle As CAA Administrator

The Senate confirmed, without objection, the nomination of James T. Pyle as Administrator of the Civil Aeronautics Administration.

Approval of the new CAA chief quickly followed his unanimous endorsement by the Senate Commerce Committee which questioned Pyle closely on the agency's status.

The CAA, meanwhile, announced the appointment of William B. Davis as Deputy Administrator.

The former Director of the Office of Flight Operations and Airworthiness was transferred to Washington from Kansas City, Mo., in November 1955. He had served there as Deputy Regional Administrator.

Davis served as a superintendent of flight operations and test pilot for bombers being produced under Navy contract during World War II.

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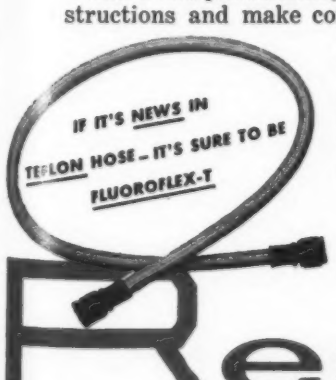

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Douglas Starts Assembling the DC-8

Nose cone section goes together first at new $20-million Long Beach, Calif. facility; special equipment includes giant four-way stretch press.

By FRED S. HUNTER

First assembly on the DC-8 jet airliner—the nose section—got under way on schedule Feb. 18 at the Douglas Aircraft Co.'s new C-8 plant at Long Beach, Calif.

C-8 is the new $20,000,000 facility now nearing completion across the road from the Long Beach division plant, where the C-133 turboprop transport and the B/RB-66 twinjet bomber currently are in production for the Air Force.

To be devoted exclusively to DC-8 assembly, C-8 comprises twin production hangars having a total of 1,070,000 sq. ft. of floor space. Construction of the sub-assembly hangar, where work is in progress on the first nose section, is complete. Roof is on the final assembly building and construction on it will be completed within 60 days.

Between the two production buildings is a two-story office structure for the location of executive offices, offices for technical representatives of airline customers, cafeteria and similar related units.

• **For 20 years** Santa Monica has been the home of the Douglas transport line. The DC-8 is a product of the Santa Monica division's engineering department headed by E. F. Burton, but all assembly of the jet transport will be the responsibility of the Long Beach division.

This is a new policy decision. Originally the Santa Monica division was to have had responsibility for certain sub-assemblies which were to have been accomplished at that location. Now, some DC-8 fabrication will be done at Santa Monica, but if it performs any sub-assembly work it will be as a sub-contractor of the Long Beach division of which K. G. Farrar is vice president and general manager.

Douglas is making sure, however, that it loses none of the commercial transport efficiency that has characterized production of its DC transports in moving the DC-8 to Long Beach. It is staffing C-8 with key personnel possessing Santa Monica experience. General superintendent is D. H. Voss, with almost 23 years at Santa Monica, where his last post was superintendent for sub-assembly and structures on the DC-6/7 series.

C. T. Walker, superintendent of final assembly, also is a Santa Monica 20-year veteran. T. G. Lennon, superintendent of DC-8 sub-assemblies, belonged to the Long Beach division, where he was assistant superintendent of B/RB-66 structures, but before that he put in seven years at Santa Monica.

Others transferred to C-8 from Santa Monica: Robert Wendell, chief of DC-8 planning; R. A. Spence, chief of manufacturing control; Wayne Stafford, chief of production control; H. C. Williams, chief inspector.

Special Equipment Used

Numerous items of special equipment intended exclusively for production of the big jet airliner are being put into operation at the Long Beach division. One of the more imaginative units is a four-way stretch press now being installed in Building 6 of the present Long Beach plant for use in accomplishing a complex forming job on the DC-8 wing skins. This giant machine is said to be the only stretch press in the world capable of four-way stretching due to the upper retention unit, which exerts a 2,400-ton clamping force against the part.

Douglas engineers developed the method and design criterion for a machine on which the forming could be accomplished and the Sheridan-Gray Co. of Torrance, Calif. was given the contract for its design and construction. Total cost of the machine, including installation, exceeds $500,000. It was designed and built in four months whereas presses of this size normally require a year or more for development and completion. Following includes some of the pertinent data on this unusual press:

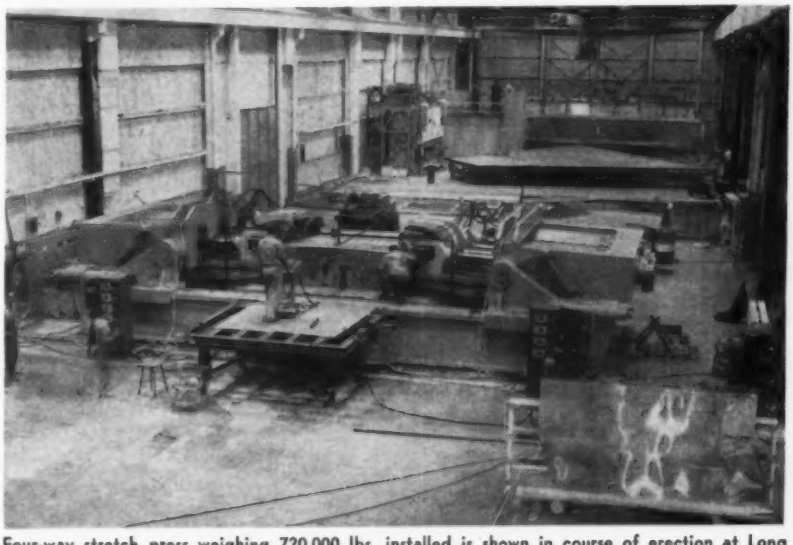
Overall length	36 ft.
Overall width	18 ft.
Overall height	14 ft.
Gross weight	720,000 lbs.
No. of stretch jaws	four
Stretch tonnage per jaw	300 tons
Die table size	145 in.x199 in.
Die area	96 in.x110 in.
Die table lift capacity	450 tons
Upper retention assembly size	162 in.x216 in.
Upper retention assembly tonnage	2,400 tons

Along with the four-way stretch press, installation has been completed on a new deep-freeze box for the DC-8 wing skins, a special vacuum lifting device for handling the skins, and an aluminum aging oven for curing the skins after forming.

Refrigeration, to prevent ageing of heat-treated aluminum until the metal has been formed, is standard procedure, but the deep-freeze box at Long Beach is unusual due to its size. Inside dimensions are 12 ft. wide by 48 ft. long by 5 ft. deep, with six inches of insulation.

• **DC-8 wing skins** are made from one of the largest tapered sheets of 75ST aluminum ever rolled. The sheets average 10 ft. 4 in. wide by 46 ft. 3 in. long and weigh approximately 1,250 lbs. They are .230 in. thick for the first 14 ft. 7 in. of length, tapering to .129 at the thin end.

First shipment of the tapered sheets recently was received from the Alcoa mill at Davenport, Ia., packed in dry ice to maintain a constant tempera-



Four-way stretch press weighing 720,000 lbs. installed is shown in course of erection at Long Beach, Calif. plant of Douglas Aircraft Co. It was designed for complex forming of wing skins of the Douglas DC-8 jet airliner. Trim table and "deep-freeze" ice box in background.

ture during shipping. Forty-eight of the DC-8 wing skin sheets can be stored at one time in the big freezer, which has a three-section removable top handled by an overhead building crane.

Vacuum Lifting Device

The vacuum lifting device is used to unload the sheets from the railroad flat car on which they are shipped and then handle them from one work area to another throughout the forming process. Manufactured by the Vac-U-Lift Co. of Galen, Ill., the device has 32 vacuum pads 6 in. in diameter with a lifting capacity per pad of 338 lbs. horizontal and 169 lbs. vertical at 25 in. of mercury.

Total lifting capacity of the unit is 10,800 lbs. horizontal and 5,400 lbs. vertical, giving approximately 4-to-1 safety factor in transporting the 1,250-lb. skins from the freezer to the trim table, then the four-way stretch press and finally onto the racks used in the ageing oven. Latter has a temperature range of 150° to 450° F.

Equipped with vertical air lift doors at both ends and one in the center, the 50-ft. long oven can be operated as one long unit, or two separate units approximately 25 ft. long. It has a maximum load capacity sufficient to handle five of the 1,250-lb. skins.

Another new installation to handle large DC-8 parts is a quick-quench heat treat tank, also located in Building 6 at the Long Beach plant. This building, incidentally, is one of these owned outright by the Douglas company. Some parts of the Douglas Long Beach division facility are owned by the Air Force, but about the only appreciable manufacturing unit to be used in production of the DC-8 under hourly rental agreement with the government is a Farnham spar mill.

Douglas also will be able to make use, under similar terms, of a large-scale environmental test chamber and other test facilities installed by the Air Force at Long Beach two years ago for the B/RB-66 program. ◈◈◈

Air Associates Changes Name in Reorganization

One of the oldest manufacturers of aviation products, Air Associates, Inc. has announced "sweeping changes" in its organization under the name Electronic Communications, Inc., involving a redirection of aims, new emphasis on electronic research and physical relocation of all operations.

Electronic Communications, Inc. was formerly the name of Air Associates' subsidiary. The 30-year-old name Air Associates will be retained for an aviation supplies division carrying on the company's original activities as a distributor, which continues to be an important part of its operations.

Frank W. Godsey, Jr., elected president of the company last July, explained: "The company's name change, just voted by the shareholders, is a logical move. We believe that by assuming the name of our fledgling subsidiary, Electronic Communications, Inc., we are more accurately describing our future activities."

GODSEY

ECI has established a research center in Baltimore with Dr. Donald D. King, former director of the Johns Hopkins Radiation Laboratory, as its director. All facilities presently located in New Jersey, at Teterboro and Orange, will be moved to St. Petersburg, Fla.

Other members of the new ECI top management team are W. R. Yarnall, financial vice president; Charles A. Sereno, executive vice president; Lorian W. Willey and Thomas F. Grieser, vice presidents for material and manufacturing respectively.

Dr. King and his staff of scientists are concentrating on electronic countermeasures research, fire control systems, infra-red work and related military electronics research.

Hiller's X-18 Tilt-Wing VTOL Proposal

Hiller Helicopters, Inc., holds a $1.5-million USAF contract for development of the X-18 VTOL prototype. Tilt-wing aircraft will use a Chase C-122 fuselage and Allison T40 turboprop engines made available by Navy. Note reaction jets in tail for control and stability purposes.

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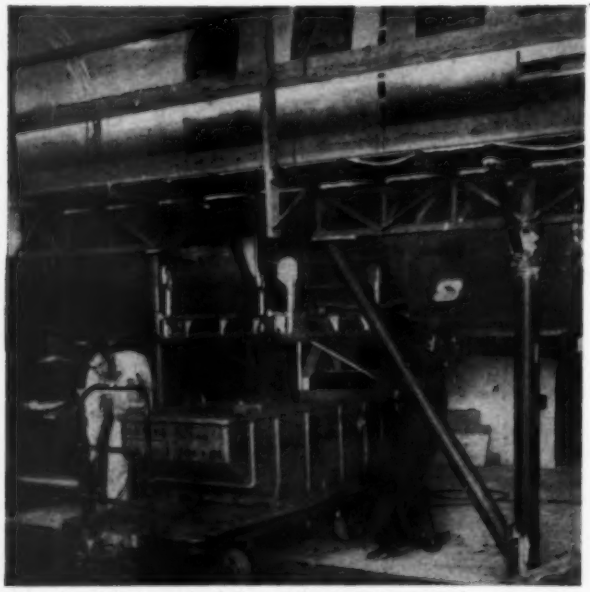
Pushbutton Loading For Electra Baggage

New "pushbutton" baggage-loading system developed by Lockheed for American Airlines' turboprop Electras is designed to load four special 36-by-77-in. fiberglass bins in four minutes. Photos show sequence of handling from ground to airplane, an operation designed to keep the turboprop's ramp time at intermediate stations within AA's planned 10-to-12 minute allowance.

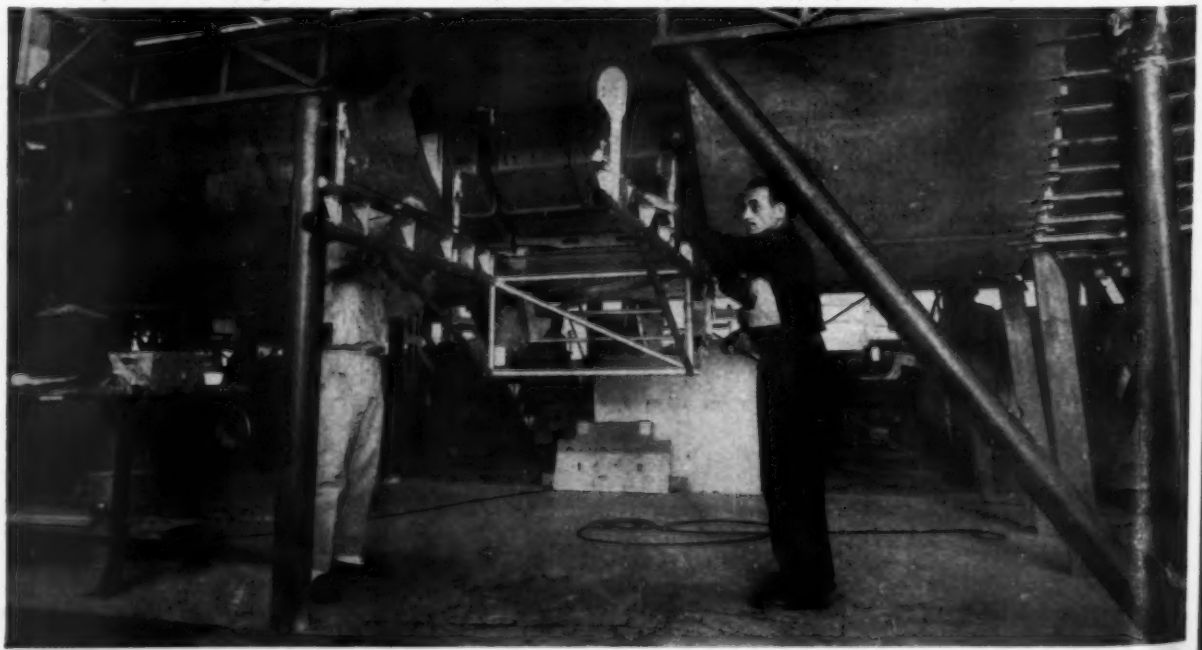
AA stewardess and v.p.-customer service R. E. S. Deichler inspect loaded bin. Its maximum weight is 400 lbs. empty weight, 55 lbs.



Fiberglass bin is preloaded at ticket counter, moved to ramp on dolly. Each unit holds about 12 pieces.

Cargo handlers simply push button after attachment to hoist; bin is raised to compartment floor level in 15 seconds.

Conveyor moves bin to rear of compartment in about five seconds as second unit is hooked to hoist and ready for loading. Electrically-powered hoist weighs 150 lbs., can be easily handled by two persons on ramp. System is patented by Lockheed.



Fenwal Fire-Heat Detector: A New Approach

Key components in design are sensing element based on use of inorganic salt insulator and an amplifier without tubes or transistors.

Fenwal, Inc. of Ashland, Mass. has unveiled a new fire and heat detector system company officials feel will set new levels of reliability and performance in aircraft fire protection.

The Fenwal design, a "continuous" type system as distinguished from those depending on strategically located detectors, has completed laboratory tests. The company is now negotiating with commercial airlines and the military services in preparation for an exhaustive inflight service test.

• **Key components** in the new design are a sensing element based on use of inorganic salts as an insulator and an amplifier that uses no vacuum tubes, transistors, relays or other moving parts. Fenwal engineers, on the basis of tests culminating a 10-year development program, feel the new system will overcome the "bugs" which to date have limited airline and military acceptance of continuous detection techniques.

This same unreliability of fire detection devices, principally the "false alarm" type of failure, recently touched off an Air Force-sponsored study by National Bureau of Standards into basic detection system requirements (AMERICAN AVIATION, Dec. 31, 1956, p. 29).

False Alarms Costly

According to Fenwal, one major airline's operation has been hampered by this "false alarm" problem to such an extent that the carrier estimates direct and indirect losses resulting at several million dollars during the last few years.

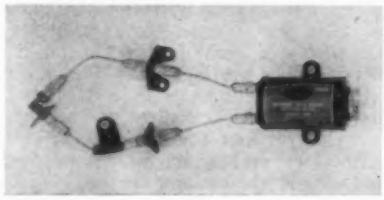
In the Fenwal system, the main sensing element is installed as a continuous cable around or through the protected engine or aircraft zone. It consists of a seamless tube with a nickel wire conductor running through its center. To insulate the wire from the shell, Fenwal developed a mixture of inorganic salts.

•**During normal** aircraft operation, the center wire carries a low-voltage a-c current supplied by a control unit that is wired into the aircraft electrical system.

Should a fire or overtemperature condition develop, the resistance of the salt insulation drops sharply, thereby allowing a large increase in current flow between the center wire and shell.

This current change is sensed by the control unit which, in turn, generates an output signal to actuate the cockpit warning light circuit.

Key factor in the accuracy of the system is the use of the inorganic salts as an insulator. By comparison with



Mockup of new Fenwal loop detector system shows control unit (right), cable, fittings and three types of connectors.

thermistor-type materials used in present continuous fire detector systems, the salt employed by Fenwal undergoes a several-hundred fold more rapid drop in resistance at the alarm temperature.

As a result, relatively small temperature differences produce large resistance differentials, so there is a significantly large difference in resistance between adjacent points not having the same temperature.

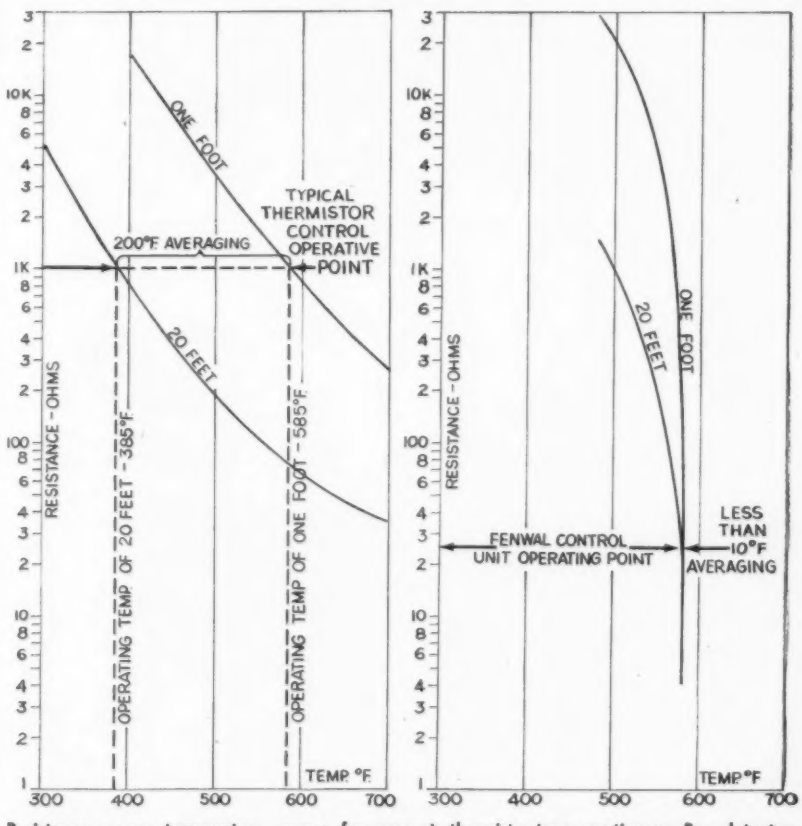
This, Fenwal engineers say, gives the new detector a discrete sensing which, in effect, permits each small segment of the continuous loop to act somewhat like a unit detector and respond at a pre-set alarm temperature without being affected by neighboring units.

• **This "discrete sensing"** distinguishes it from thermistor-type systems in that the circuit resistance of the latter is governed both by the temperature and length of detector exposed to the temperature.

In such installations, the greater the length of detector exposed to a given temperature, the lower will be the circuit resistance. This effect, called "averaging" (see chart), is explained using a comparison of the alarm temperatures for a one-foot and 20-ft. length of typical thermistor detector.

As illustrated, in the one-foot section the resistance drops to the actuation level (nominally 1,000 ohms) when the temperature reaches 585°F, whereas in the 20-ft. section the 1,000-ohm level occurs at only 385°F.

With this arrangement, even



Resistance versus temperature curves for present thermistor-type continuous fire detector system (left) and new Fenwal system show sharp reduction in "averaging" effects, according to company engineers.

though the alarm may be desired at 585°F, the averaging tendency of the longer loop allows the system to trigger at appreciably lower engine section temperatures. The result: a false alarm.

• **The usual recourse,** Fenwal officials explain, is to raise the temperature setting of the system. Although this reduces the frequency of false alarms, it also makes it necessary for short sections within the loop to be heated as much as several hundred degrees above the present alarm temperature to obtain the needed resistance drop for actuation.

System Desensitized

The net result of this fix is a desensitizing of the system, as it increases the time necessary to detect concentrated hot spots or to pinpoint flames under conditions where a few seconds in delayed warning can spell the difference between a controllable flame and a destructive fire.

The discrete sensing of the new Fenwal system renders it virtually free of these averaging effects (see chart). The same one-foot and 20-ft. sections of loop will respond within 10°F of each other, company engineers say, and the response temperature actually remains within 10°F for any length of section from 20 ft. down to 1/8th inch.

To suit various system needs, Fenwal has developed a large family of salt combinations for use over a wide temperature range. Detectors can be produced for operation at any temperature from 350° to 1,200°F. Fenwal is developing others for use at 2,000°F.

The cable used by Fenwal is 0.088 in. diameter Inconel tube weighing 0.016 lbs. per linear foot. All metal-to-metal bonds are heliarc welded and ceramic hermetic seals in end fittings are brazed with pure silver.

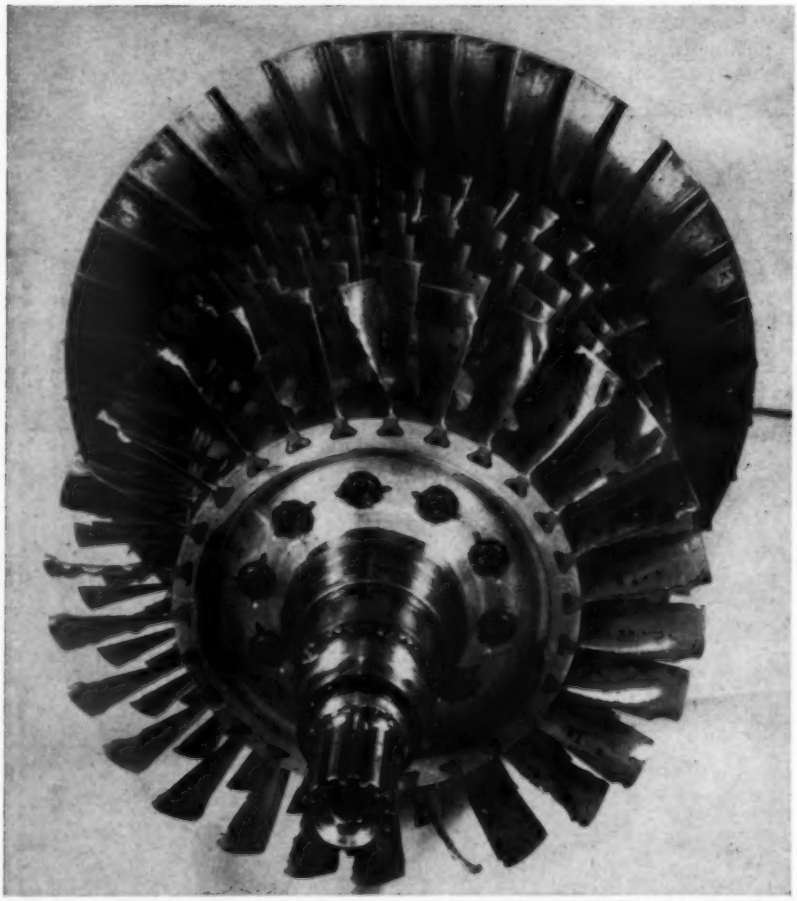
Control unit for the system is a hermetically-sealed magnetic amplifier that weighs 9¼ oz. and measures 4 in. long by 2 in. in diameter. In normal operation it has a power requirement of less than one watt increasing to 10 watt rms during an alarm situation.

• **Fenwal's detection circuit** operates at low impedance—25 ohms compared with 250 to 1,000 ohms for other systems, company engineers point out. The advantage—the system is much less susceptible to false alarm tendencies due to moisture.

And basic circuitry is fail-safe in design. It will operate 100% normal and signal an actual fire or overheat condition, without a false alarm, should an open circuit develop in the detector loop or an open or ground occur in any of the external wiring.

For actual application in aircraft, the continuous system is designed for use in a variety of locations. In addition to the principal use in powerplant and wheel-well areas, it can be employed in baggage compartments, electronic equipment compartments or other vulnerable areas. ◆ ◆ ◆

T53 Compressor Displays its Durability



First photo of axial-centrifugal compressor arrangement on Lycoming's T53 turboprop shows how blades withstood ingestion of 2 x 3 x 0.3 piece of magnesium. Blades are twisted and bent, but none broken. Axial compressor uses 403-type stainless, centrifugal stage, 422 stainless. Lycoming hasn't had a centrifugal compressor failure in 2,000 hours of operation.

Fred Lee Gets Post With Olin Mathieson

LEE

Fred B. Lee, former Civil Aeronautics Administrator, has been named assistant to William Foster, executive vice president in charge of high-energy fuel operations at the Olin Mathieson Chemical Corp.

Lee was CAA Administrator from April 1953 until his resignation in December 1955. He was Deputy Administrator from 1947 to 1953.

AIA Contradicts House Group on Cost Of Hiring Engineers

Aircraft Industries Association has taken sharp issue with the findings of the House subcommittee on the costs of recruiting defense contract engineers. AIA says Rep. James C. Davis (D., Ga.) misinterpreted Navy-furnished data, which shows an $808 average hiring cost per new engineer as against the subcommittee's figure of $1,317.

Navy figures its costs on a gross-hire basis, whereas the subcommittee figures its costs on a net-hire basis. To highlight the "inconsistency" of the net-hire method, AIA asks what the cost per new engineer would be if a company spent $10,000 recruiting ten engineers, and in the same period lost ten engineers.

The subcommittee was also criticized for stating that "firms with defense contracts spent over ten times as much (as commercial business firms) for recruiting." In this instance, AIA says, the recruiting costs of 37 defense contractors were equated to the costs of only 17 commercial firms.

Observing that no testimony was taken from the aircraft industry during the subcommittee's investigations, AIA expressed the hope that Congress will confer with industry before any "corrective" action is taken; otherwise, it said, decisions might be made that would gravely jeopardize the overall defense effort.

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Needed: Breakthrough on 1,800° F-Plus Alloys

By WILLIAM BELLER

"We are bankrupt of ideas for developing materials useful in the over-1,800°F range," William H. Woodward, secretary of National Advisory Committee for Aeronautics' subcommittee on powerplant materials, says.

"This is a strong way to put it," he told AMERICAN AVIATION, "but it is the situation as I see it." He observed that lack of materials having at least a longtime 15,000-psi rupture strength in the over-1,800°F range is one of the major factors limiting powerplant developments today.

Woodward's statements were given some military backing when Lt. Gen. Thomas S. Power, chief of Air Research and Development Command, said recently that engine designers talk about temperatures of 2,000°F to improve turbojet performance, but there are just no materials available to do the job.

"What we need are major breakthroughs all along the line . . . dramatic and revolutionary developments without which we cannot accomplish our mission of maintaining qualitative superiority in the air," Power says.

Here are some of the facts as Woodward sees them: The melting point of a metal is an indication of its limiting useful operating temperature. For over 1,800°F work, this fact makes many of our metals unusable for longtime high-stress applications; such metals include iron, cobalt and nickel.

From a graph showing melting temperatures versus atomic number, it is apparent that only a handful of metals can now be considered. Of these elements, all have serious drawbacks to their use. Many of them, such as molybdenum, columbium, tantalum and tungsten, oxidize quickly. Satisfactory coatings for these metals have not been developed.

Most of the other heat-resistant elements are either too rare to be used or else have highly undesirable properties when alloyed. Cermets could be used but only if their brittleness and fabrication problems are recognized.

Woodward observed: "The conventional development approach cannot be used if we wish to develop high-temperature materials. We need more imaginative thinking. The days of cookbook metallurgy, of adding a pinch of this and a pinch of that, hoping to come up with a satisfactory alloy, are gone." He added that some far-seeing companies and organizations are exploring new fields, but that as of today we still do not have any material that can adequately service a high-temperature powerplant.

The approaches being used include: (1) an extension of the SAP process, which alloys aluminum with aluminum oxide; (2) alloying with trace elements, solid or gaseous; (3) studying the properties of cermets containing relatively low percentages of ceramics, (4) investigating the atomic properties of alloys; (5) in the practical case of powerplant design, perhaps taking recourse to cooling techniques, which often give satisfactory solutions.

Woodward pointed out that some scientists have a different view of the problem. "Julius Harwood," for example, [head of the metallurgy branch] of the Office of Naval Research, "may not endorse all that I have said."

Harwood did agree that we are on a plateau insofar as the production of new heat-resistant materials are concerned. "But," he said, "when the same imaginative thinking that is now hav-

Short-Time Tensile Properties of Materials

MATERIAL	Density (lb./cu. in.)	TEMPERATURE 1000°F UTS (ksi)	YS (ksi)	EL (%)	E (10⁻⁶ psi)	1400°F UTS (ksi)	YS (ksi)	EL (%)	E (10⁻⁶ psi)	1600°F UTS (ksi)	YS (ksi)	EL (%)	E (10⁻⁶ psi)	1800°F UTS (ksi)	YS (ksi)	EL (%)	E (10⁻⁶ psi)	1900°F UTS (ksi)	YS (ksi)	EL (%)	E (10⁻⁶ psi)
STAINLESS STEELS																					
321	0.285	61	27	35	22.5	28	15	70	20	14	11	82	18.5	5	...	..	...	..	..	..	..
310	0.284	67	26	50	22.5	42	21	27	20	24	17	43	18.5	11	...	55	17.5	..	..	..	..
HIGH-TEMP. ALLOYS																					
Iron-Base																					
19-9DX (Stress Relvd at 1200°F)	0.287	95	77	20	...	53	50	24	...	40	37	56	...	13	10	85	...	..	..	..	..
A-286	0.286	119	89.1	17	23.5	56	54	18.5	20.6	20	20*	80	18.9	10*	...	..	17*	..	..	..	..
J-1300	0.303	152	120	20	23.8	95	83	25	21.5	...	...	..	...	...	...	..	...	..	..	..	..
Nickel-Base																					
Hastelloy X	0.297	94	42	45	24.4	63	38	37	20	36	26	50	18.6	21	17	43	...	12	..	45	..
Inconel X	0.298	140	84	22	25	80	62	...	20.2	34	24	47	16*	9	5.5	89	...	..	..	..	..
Inco 700	0.295	147	95	28	27.7	..	..	...	...	83.5	55.5	7	...	33.5	20	27	...	..	..	..	..
Hastelloy R	....	...	...	..	...	..	..	...	...	90	...	5	...	38	...	14	...	22	..	18	..
Cobalt-Base																					
N-155	0.300	90	40	37	24.5	58	35	38	21	32	24	42	17.5	17	12	38	...	14	..	43	..
L-605	0.330	100	35	67	27	53	37	14	26.3	37	34	18	25	23	...	19	...	18	..	20	..
S-816	0.313	121	46	27	...	88	40	25	...	51	...	17	...	26	...	20	...	..	..	..	..
MOLYBDENUM ALLOYS																					
½% Ti	0.369	104	87	17	41.4	94	80	16	40	88	77	15	39	79	70*	..	38*	74	68*	..	37*
REFRACTORIES																					
Titanium Carbide	0.216	...	...	..	...	..	..	...	...	47	...	..	...	40	...	..	...	35	..	..	..

* *Extrapolated*

All materials in production except Inco 700 and Hastelloy R.

All materials in optimum heat-treat condition

UTS—Ultimate Tensile Strength
YS—Yield Strength
EL—Elongation
E—Young's Modulus

(Based on table by Allan V. Levy, Director of Materials and Processes, Marquardt Aircraft Co.)

OKINAWA RESCUE—The 28-man crew of an Army tug was rescued by a Sikorsky H-19 of the U. S. Air Force's Air Rescue Service after the tug was wrecked on a reef off Naha, Okinawa. The tug went aground aiding the Army coastal tanker in the background, also stranded on the reef.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS

WORLD'S FASTEST—A Marine Corps Sikorsky HR2S-1 has set a world record of 162.7 mph. Flown by Major Roy L. Anderson, left, and Robert Decker, Sikorsky test pilot, the HR2S also set new records carrying 13,250 lbs. to 7,000 feet (surpassing a Russian record), and 11,050 lbs. to over 12,000 feet.

NEW RADAR HELICOPTER—Under development for the Navy by Sikorsky Aircraft is this HR2S-1W helicopter with radome accommodating search radar gear. It can extend radar coverage beyond the range of shipboard radar or land-based radar picket aircraft.

CHICAGO AREA passenger service has been inaugurated by Chicago Helicopter Airways, using Sikorsky S-55s of the type which pioneered in similar operations in New York and Los Angeles.

IN EUROPE, Sabena Belgian World Airlines has received the first two of a fleet of 12-passenger Sikorsky S-58s. Landing at Brussels, above, after a delivery flight from Paris, an S-58 averaged 146 mph for the 185-mile distance, setting a new city-center to city-center record. Sabena started commercial helicopter service in Europe with Sikorsky S-55s.

HELICOPTER HISTORY

FIRST SIKORSKY SPEED RECORD

On June 3, 1946, at Dayton, Ohio, an Army Air Force's Sikorsky R-5A, above, flew 110.849 mph. This was a world record for maximum speed without payload over a 20-kilometer course.

SIKORSKY AIRCRAFT

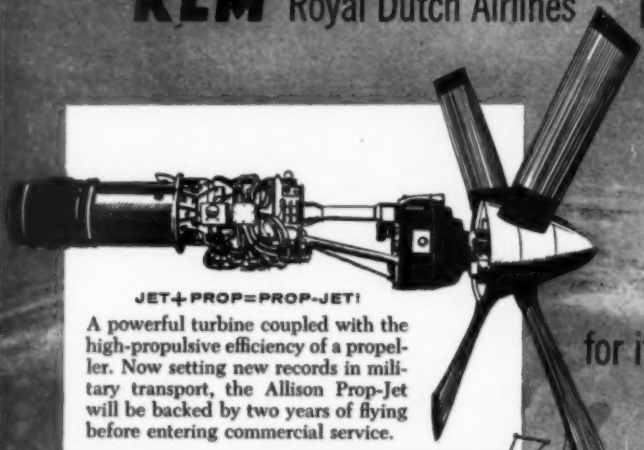
BRIDGEPORT, CONNECTICUT

One of the Divisions of United Aircraft Corporation

KLM Royal Dutch Airlines pioneers the overseas jet age with

Allison Prop-Jet Power

for its new fleet of Lockheed Electras



JET + PROP = PROP-JET!

A powerful turbine coupled with the high-propulsive efficiency of a propeller. Now setting new records in military transport, the Allison Prop-Jet will be backed by two years of flying before entering commercial service.

KLM ROYAL DUTCH AIRLINES

A new "Treat to go Dutch" for world air travelers

KLM Royal Dutch Airlines, the world's first airline, steps into the jet age of world air travel by ordering a brand-new fleet of 7-mile-a-minute Lockheed ELECTRAS with Allison Prop-Jet power.

KLM made this selection *after careful evaluation of all propeller-type aircraft power plants now built, or soon to be available.*

The 15,000 horsepower of the four Allison Prop-Jet engines will wing the Lockheed ELECTRA through the air at well over 400 miles per hour, cutting KLM's time schedules by 30% and providing new smoothness and quiet comfort over KLM's 152,000-mile air network.

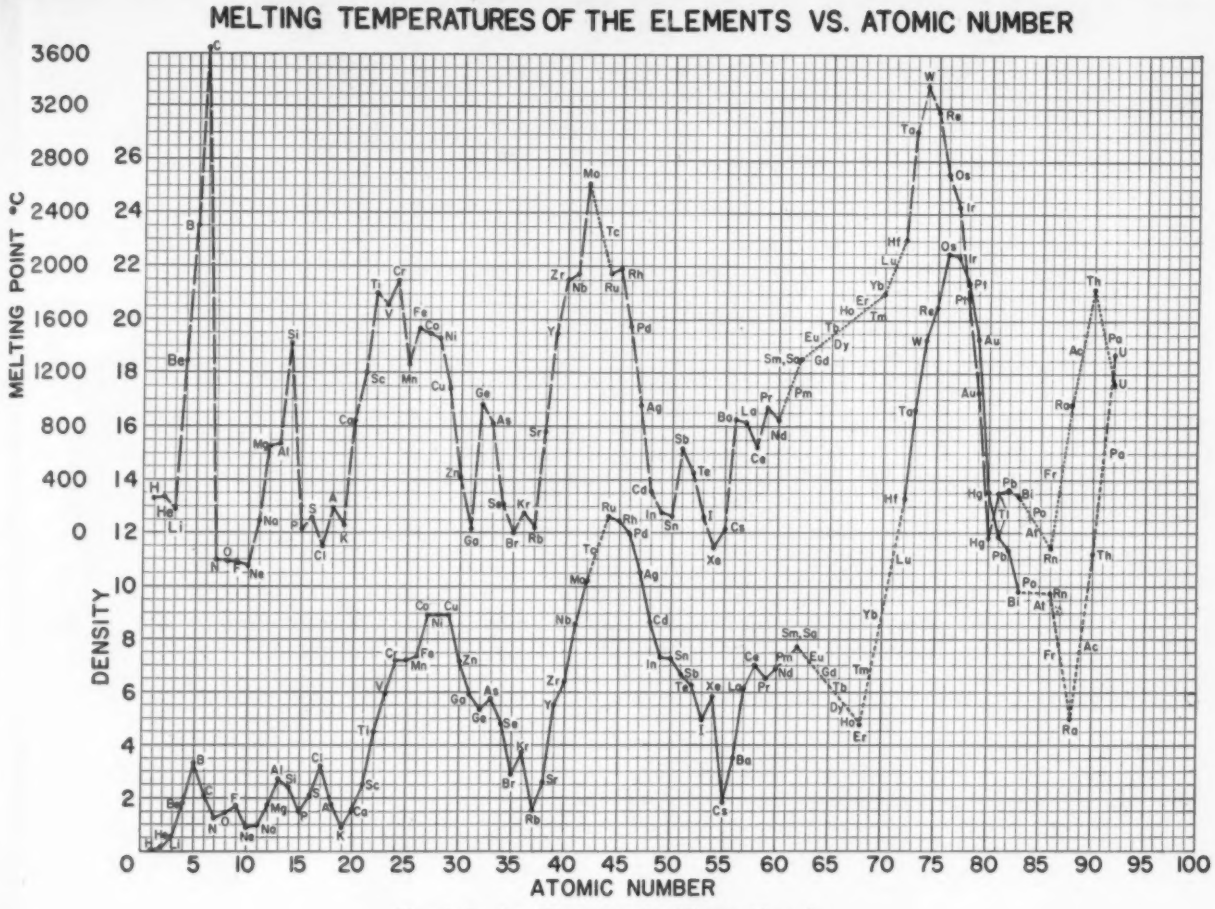
What's more, it can operate out of "short-hop" airports with runways shorter than those required by today's four-engined transports.

In selecting Allison Prop-Jet power, KLM has demonstrated the same foresight that has marked the purchase of Allison Prop-Jet engines and Aeroproducts propellers by 5 major U. S. airlines—American, Eastern, National, Braniff and Western.

ALLISON DIVISION OF GENERAL MOTORS • *Indianapolis, Indiana*

ALLISON PROP-JET POWER

AMERICAN-BUILT FOR THE JET AGE IN AIR TRAVEL



(Symbols for Elements in Chart Above)

A. Argon. Ac, Actinium. Ag. Silver. Al. Aluminum. As, Arsenic. At, Astatine. Au, Gold. B, Boron. Ba, Barium. Be, Berlyyium. Bi, Bismuth. Br, Bromine. C. Carbon. Ca, Calcium. Cd, Cadmium. Cl, Chlorine. Co, Cobalt. Cr, Chromium. Cs, Cesium. Cu, Copper. Dy, Dysprosium. Er. Erbium. Eu, Europium. F, Fluorine. Fe, Iron. Fr. Francium. Ga, Gallium. Gd, Gadolinium. Ge, Germanium. H, Hydrogen. He, Helium, Hf, Hainium. Hg, Mercury. Ho, Holmium. I, Iodine. In, Indium. Ir. Iridium. K, Potassium. Kr, Krypton. La, Lanthanun. Li, Lithium. Lu, Lutetium. Mg, Magnesium. Mn, Manganese. Mo, Molybdenium. N, Nitrogen. Na, Sodium. Nb, Columbium. Ne, Neon. Ni, Nickel. O, Oxygen. Os, Osmium. P, Phosphorus. Pa, Protactinium. Pd, Palladium. Pm, Promethium. Po, Polonium. Pr, Praseodymium. Pt, Platinum. Ra, Radium. Rb, Rubidium. Re, Rhenium. Rh, Rhodium. Rn, Radon. Ru, Ruthenium. S, Sulfur. Sb, Antomony. Sc, Scandium. Se, Selenium. Si, Silicon. Sm, Sa, Samarium. Sn, Tin. Sr, Strontium. Ta, Tantalum. Tb. Terbium. Tc, Technetium. Te, Tellurium. Th. Thorium. Ti, Titanium. Ti. Thallium. Tm, Thulium. U, Uranium. V, Vandium. W, Tungsten. Xe, Xenon. Y, Yttrium. Yb, Ytterbium. Zn, Zinc. Zr, Zirconium.

ing such a profound influence in metallurgical research exerts a similar influence on designers, then they will be able to enlarge appreciably the useful range of materials we already have."

Examples of such design initiative are: (1) construct turbines that are able to use brittle materials; (2) use appropriate cooling methods; (3) operate in an inert atmosphere, where oxidation cannot occur. He asked "If today we offered the gas-turbine industry a satisfactory 2,000°F material, what would they do with it?"

Far from being at a loss for ideas, Harwood sees an abundance of them, with perhaps some going begging because manpower and capital can concern themselves with only a limited number. There are at least six major areas being explored:

• In the field of refractory metals, the problem of protection against oxidation holds good promise of being solved, probably within the next few years.

• In the field of fabrication techniques, the Universal-Cyclops Steel Corp., Bridgeville, Pa., is building a facility to form high-temperature alloys in an argon atmosphere in order to avoid oxidation problems. Forming will be done at temperature ratios similar to those used in steel-mill practice. Men wearing space suits will service the rolling mill and other metal-working equipment.

• Cermets are being extensively studied with a view towards removing some of their brittleness. Metallurgists are not convinced that these materials cannot be made sufficiently ductile. The investigators are attempting to correlate the micro-structure of cermets with their fracture behavior.

• The field of dispersion hardening or fine-particle strengthening is of high interest. Metallurgists are striving to learn the influence of the size, shape, thickness and distribution of the alloying particles upon the physical characteristics of the parent metal.

• Some of these scientists feel that the high strength of our superalloys may stem from the compounds that the dispersed particles make in the metal matrix; for example, titanium oxide in a molybdenum alloy. A further extension of fine-particle hardening would include adding fibers to the metal.

• The greatest potential in the supertemperature range (greater than 2,000°C) lies in developing ceramics. So little work has been done in this area that highly important results are easily conceivable.

• Imperfection theory may be able to offer industry common metals having phenomenal strengths. General Electric has already produced metal whiskers having tensile strengths in excess of one-million psi.

A G. E. material with less spectacular characteristics is the newly announced J1300 alloy, which has reached the prototype production stage. J1300 is being produced by the company's Metallurgical Products Department in Detroit. The material was designed for key jet-engine components operating in the 1,200-1,400°F temperature range. It is the latest alloy in G. E.'s line of jet-engine materials, which includes the J1500 and J1570,

WE COULDN'T SHAKE ITS ACCURACY

This unretouched photograph shows the Lear Miniature Rate Gyro strapped to a jackhammer, riding side-saddle through two hours of pneumatic nightmare. After this "shakedown run" the gyro still performed up to the most exacting specifications set for the newest Air Force, Navy and Army missiles. This gyro is available right now. How many do you need?

LEAR MINIATURE RATE GYRO

LEAR INC.,
GRAND RAPIDS DIVISION,
GRAND RAPIDS, MICHIGAN

IP-14

two heat-resistant alloys in current use.

The new alloy has demonstrated good weldability and formability characteristics. Plans are now under way to specify J1300 for critical structural sheet components in the J79 engine. Other than calling the material a high-strength iron-base alloy, G. E. is keeping the J1300 constituents proprietory, and is not offering it for industry sale. The physical characteristics are included in the accompanying tables, which show the properties of several heat-resistant alloys.

For airframes, skins and other structural components, the Dow Chemical Co. has developed a new magnesium alloy designated HM 21XA-T8. Strength of the alloy in the 600-700°F range is said to be superior to that of the best heat-resistant aluminum or magnesium alloys in production today.

Physical Properties of Heat-Resistant Alloys

Material	Density (lb./cu.in.)	Melting Pt. (°F)	Mean Coef. of Thermal Expansion (°F)	(Per °Fx10-⁶)	Coef. of Thermal Conductivity (°F)	(BTU/hr/ft/°F/in.)
321	0.285	2575	32-212	9.3	200	112
			32-600	9.5	1000	152
			32-1000	10.3	....	...
			32-1200	10.7	....	...
			32-1800	11.2	....	...
310	0.284	2600	32-212	8.0	200	96
			32-600	9.0	1000	130
			32-1000	9.4	....	...
			32-1200	9.7	....	...
			32-1800	10.6	....	...
19-9 DL	0.287	2600	70-212	8.2	200	101
			70-600	8.7	600	117
			70-1000	9.5	1000	134
			70-1200	9.7	1200	143
			70-1600	10.2	1400	150
			70-1800	10.5*	1600	163
			70-2000	11.0*	....	...
Inconel X	0.298	2540	100-200	7.6	Room	85
			100-400	7.7	600	137
			100-600	7.9	1000	144
			100-800	8.0	1200	156
			100-1000	8.2	1400	168
			100-1200	8.4	1600	180
			100-1350	8.7	1800	195
			100-1500	9.0	....	...
			100-1600	9.2	....	...
Inco 700	0.295	....	70-200	6.84	200	90
			70-400	7.21	400	94
			70-800	7.79	600	99
			70-1000	8.02	1000	111
			70-1200	8.32	1200	115
			70-1400	8.68	1400	121
			70-1600	9.27	1600	126
Hastelloy X	0.297	2400	79-200	7.70	....	...
			79-400	7.82	....	...
			79-600	7.90	....	...
			79-800	8.15	....	...
			79-1000	8.39	....	...
			79-1200	8.56	....	...
			79-1350	8.76	....	...
			79-1500	8.92	....	...
			79-1650	9.07	....	...
			79-1800	9.20	....	...
N-155	0.300	2500	70-600	8.70	392	101
			70-800	8.89	572	110
			70-1000	9.10	752	120
			70-1200	9.40	932	129
			70-1500	9.77	1112	139
			70-1600	9.90	....	...
S-816	0.313	2400	70-600	6.6	392	101
			70-800	6.9	572	119
			70-1000	7.1	932	142
			70-1200	7.4	1112	155
			70-1400	7.7	1292	155
			70-1600	8.0	....	...
			70-1800	8.3	....	...
L-605	0.330	2570	70-600	7.61	....	...
			70-800	8.28	....	...
			70-1000	8.30	....	...
			70-1200	8.55	....	...
			70-1400	8.92	....	...
			70-1600	9.30	....	...
			70-1800	9.70	....	...
½% Ti Molybdenum	0.369	4720	32-200	2.67	....	...
			32-400	2.75	....	...
			32-800	2.90	....	...
			32-1000	2.98	....	...
			32-1400	3.13	....	...
			32-1600	3.21	....	...
			32-1800	3.28	....	...
			32-2000	3.36	....	...
			32-2200	3.43	....	...
			32-2400	3.51	....	...
			32-2600	3.59	....	...
J-1300	0.303	....	Rm-200	8.20	300	90
			Rm-400	8.45	500	105
			Rm-600	8.56	700	121
			Rm-800	8.80	900	137
			Rm-1000	9.00	1000	145
			Rm-1200	9.26	....	...
			Rm-1400	9.60	....	...
			Rm-1600	10.30	....	...

*Extrapolated value. (Based on table by Allan V. Levy, Director of Materials and Processes, Marquardt Aircraft Co.)

DATA

ON THE NEW LEAR MINIATURE RATE GYRO

RUGGED AND DURABLE—It has been vibrated up to 20 G's and 2000 cps. and submitted to shock up to peaks of 110 G's without significant effect.

UNIVERSAL OUTPUT—Electro-magnetic pick-off supplies 6 volts, 400 cps. into a 10,000 ohm load at maximum rate input. Thus, units of different maximum rates may be interchanged without modification. Unit is also available including integral demodulator in a mounting base for applications requiring a DC signal output.

HIGH ACCURACY—Unit weighs only 1.2 pounds, measures only 1½" diameter by 3⅝" long, yet resolution, threshold and hysteresis closely approach zero rate.

MINIMUM "CROSS-TALK"—Patented design of torsion bar provides previously unrealized cross axis stiffness. Movements in insensitive axes virtually eliminated.

LOW THERMAL NULL SHIFT—Use of thermally compatible materials for all associated parts brings about new lows in the amount of null shift resulting from temperature changes.

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VERSATILITY—Unit is available with either 26 or 115 volts, 400 cps., 3-phase or 115 volts, 400 cps. split single phase motor. Can be supplied for any maximum rate required. Unit is readily adaptable to requirements involving different signal outputs and damping characteristics. 2 and 3 axis packages also available.

LEAR

← Circle No. 10 on Reader Service Card.

Here's a New Miniature High-Resolution Radar

Diamond Ordnance Fuze Laboratory development holds promise for pilot surveillance in low-visibility taxiing; unit also could be used as a reflectometer.

By HENRY P. STEIER

A new miniaturized radar system that promises to have unique applications to future aviation electronics instrumentation has been developed.

Known as short-pulse radar, it is presumably the outgrowth of techniques that Diamond Ordnance Fuze Laboratory, Washington, D. C. has been exploring in connection with highly secret military weapons fuze systems. It was described recently by Clyde D. Hardin, systems research engineer with this company.

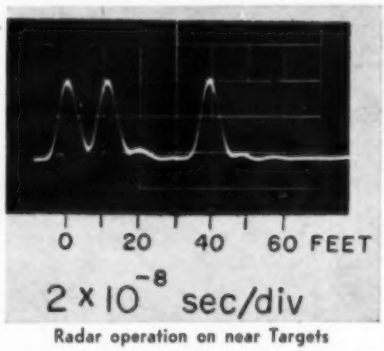
Although there is growing emphasis today on short-pulse radar applications for small distance measurements and high target resolution, complex circuitry and large components generally restrict such systems to ground-based applications.

Using ferrite materials and low voltage tubes, Diamond Ordnance (which is a part of the Army Ordnance Corps) has succeeded in producing laboratory models of short-pulse equipment that could be the forerunner of short-pulse airborne radars capable of very high target resolution.

How It Could Be Used

Some of the following needs might be served by such a radar in the future:

Surveillance radar carried aboard aircraft for use in taxiing on airports under conditions of low visibility. Taxi strips and other aircraft could be seen together with even the smallest objects such as lamp standards, etc. Radio altimeters accurate to within a few inches but capable of use to 50,000 feet might be used as part of a landing-aid system as well as during high-altitude flight operations.



Radar operation on near Targets

Test instrumentation use as a reflectometer for making time measurements in cables, waveguides and other microwave hardware to determine coefficients of reflectivity.

To produce the 10 millimicrosecond pulses in the Diamond system, a blocking oscillator of a type used in military work being done by Diamond was chosen.

The timing oscillator uses TV-type tubes and ferrite core transformers. The ferrite devices allow use of a small number of turns in the transformers to give high inductance with low capacitance.

Timing and stability in such a short pulse system is very critical. Pulses are repeated at a rate of 100,000 per second in the Diamond device.

• **A Litton Industries, Inc.** L-3028A magnetron was chosen for carrier frequency generation in the "X" band at 9300 mc. According to Hardin, it is one of the few small tubes capable of handling the very short pulses which has no cathode sparking problem under these conditions.

Biggest single factor in the utility of a radar signal received back from a target is the receiver sensitivity. Only an extremely small returned signal is available to work with.

One way out of the low signal level problem is to add stages of intermediate frequency amplification to boost the signal that has been picked up and converted to an intermediate frequency.

However, this means of using small signals is limited by the signal-to-noise ratio that develops from noise generated in the IF amplifiers themselves. As the carrier frequency becomes higher these noise problems become worse.

Another problem in radar, and one which becomes more critical in short pulse systems, is frequency control. Any frequency drift in the carrier or local oscillator causes the intermediate frequency to change by the same amount.

To overcome this the IF bandwidth may be increased to handle the frequency change and thus prevent pulse distortion. Automatic frequency control circuits are often used to tune the oscillator.

Adding many IF amplifiers and other control circuitry increases the complexity of any radar equipment. In the Diamond system this handicap has been overcome by a unique IF amplifier design.

The exact circuitry of the new IF amplifier has not been disclosed. However, performance characteristics give an indication of what has been achieved.

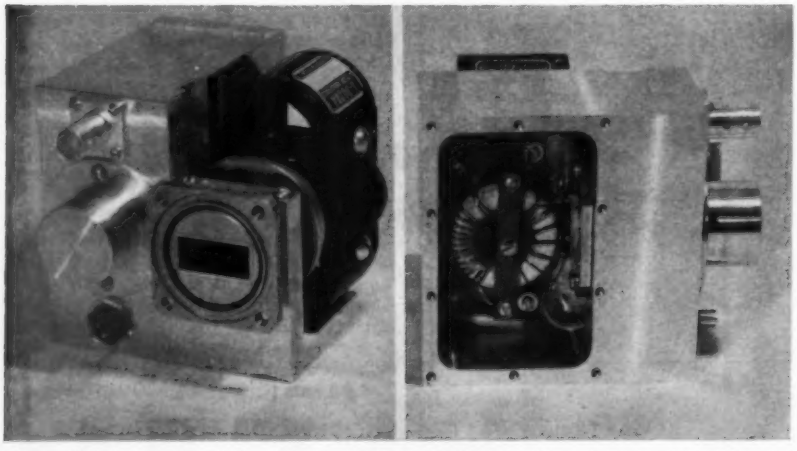
Using lumped constant circuitry, usually critical with respect to bandwidth for good amplification, an IF amplifier has been built using four tubes to give 50-mc bandwidth with over 12 db gain per stage.

Hardin says the IF amplifier development, done by Applied Research, Inc. has a capability of 100 mc bandwidth with 10 db gain per tube. In airborne surveillance or high altitude gear seven tubes might be used.

• **Laboratory equipment** built to date uses the 50-mc IF system carried in a very small chassis measuring about 7 x 1¼ x 1¼ inches. This is only about 5% the size of competitive IF circuitry now available.

The IF frequency is 400 megacycles. General Electric Co. Type 6299 tubes are used. Automatic frequency control is no problem in the Diamond

(*Continued on page 53*)



Diamond Ordnance Fuze Laboratory's new miniaturized short-pulse radar transmitter. Mounted on an aluminum cube measuring about 3½ inches on each side, the Litton Industries, Inc. L-3028A "X" band magnetron used is shown at the left. Modulator circuitry is shown inside the cube at the right. Typical oscilloscope traces of the Diamond short-pulse radar showing excellent resolution obtained from targets at 10 and 40 feet.

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circuit, Hardin says.

The wide IF bandwidth permits oscillator drift of plus or minus 20 mc without affecting pulse shape.

Sensitivity of the radar receiver is —120 db below one watt. Peak power output is 150 watts.

A Diamond laboratory breadboard altimetry system demonstrated recently at a meeting of the IRE Professional Group on Instrumentation in Washington used horn type transmitting and receiving antennas.

The transmitter, modulator and magnetron were attached directly to one of the horns. A crystal receiver circuit was attached to the other horn.

Point of first ambiguity is 5,000 feet, according to Hardin. For operation in a high-altitude altimetry system, the repetition rate could be reduced for operation above 5,000 feet.

Theoretically the system would have a range down to zero feet. However, in an operational device minimum distance would be 10 feet if antenna decoupling and compensating circuitry were not used.

The extreme accuracy possible with short-pulse radar is indicated by Hardin's statement that laboratory evaluation of the system was done with a distance indicator marked off in 6-inch increments.

Considerable interest in the radar has been shown by the Radio Technical Commission for Aeronautics' special committee on altimetry.

Know-how concerning the new radar development for commercial applications will probably be freely available to industry since Diamond's activities are funded through Army and other military projects. ◆◆◆

Aeronautical Radio Experts Debate Means of Easing RF Spectrum Crowding

Proponents of different aeronautical radio transmission and reception techniques met in Washington, D.C. for the first large scale public debate on the relative merits of their systems for alleviating radio frequency spectrum crowding and easing long-range transmission problems in the high-frequency band.

Claims and counter-claims for different single sideband and synchronous communication systems were heard by an audience of 326 registrants at a symposium sponsored by Aeronautical Radio Inc.'s Airlines Electronics Engineering Committee.

Representatives of all the military services, domestic and international airlines and government agencies attending the symposium heard Dr. John P. Costas, General Electric Co. consulting engineer, and Leonard R. Kahn, consultant to Kaiser Aircraft and Electronics Corp., describe two techniques which have recently come on the scene as possible competition to the single sideband technique being proposed for aeronautical use. USAF single sideband equipment is being developed by Collins Radio Co.

• **Recent moves** have been made by the Federal Communications Commission, International Air Transport Association and USAF to push use of SSB for spectrum conservation. The International Civil Aviation Organization and International Telecommunications Union also are planning to examine SSB at their next meetings in 1957. This has raised questions as to whether SSB is the panacea, or whether GE's synchronous double sideband or Kahn's compatible single sideband system might offer better techniques.

Most critical issue in the use of a new system would be orderly implementation on an evolutionary basis. At its meeting in Montreal in 1955 the International Air Transport Association prepared the outline for a transitional program calling for evolution from present amplitude modulation through full carrier single sideband and eventually to the most advantageous system—full suppressed carrier sideband.

• **Costas maintains** favoritism for SSB is the result of excessive "brochuremanship" and that its use may save some spectrum but loses in power gain and in inability to transmit data through Air Traffic Control signalling systems of the future.

Kahn said his compatible SSB system, now in use by Voice of America stations for overcoming Russian jamming attempts, offers spectrum economy, easy transition to full suppressed carrier SSB and greatly reduced equipment complexity.

• **Capt. E. Thomas,** director Shore Based Electronics, Navy Bureau of Ships, called attention to the fact that "all these systems are not mutually compatible."

"The decision," he said, "must be based upon economics. Department of Defense is the biggest customer in electronics. Dollars will be spent here if a decision is made, and the maintenance cost must be faced." He added: "We are faced with the data transmission problem, whether we like is or not."

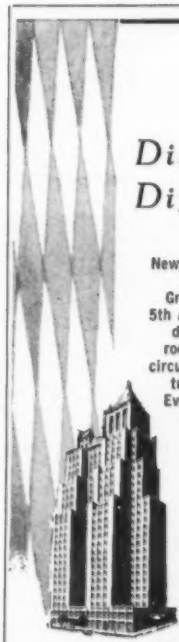
Next step towards solution of the issue by airlines groups is not known. However, there is general agreement among airlines observers that a move to SSB in any form would insure eventual compatibility between different SSB systems, some of which are capable of handling data as well as voice transmission.

Electronotes

• **The question** "Is a paper given by a computer manufacturer describing a new computer system a true and proper technical research paper for a computer conference" has been answered. Despite past thoughts that such papers smacked of advertising, the answer is "yes." Western Joint Computer Conference first scheduled for Feb. 26-28 will be stretched to Mar. 1. On that day new computer systems will be covered by a symposium especially arranged for that topic.

• **A new aid** to the armed services and the electronics communications industry is expected from the National Bureau of Standards Electronic Center being built at Boulder, Colo. Widening use of test instruments to maintain ultra-critical accuracy of new navigation, fire control, missile guidance and other gear means more checks against fundamental U.S. references for volts, ohms, time, length, mass, etc. must be made to maintain uniformity of measurement.

• **Two intensive courses** in automatic control will be given by the University of Michigan, College of Engineering. Scheduled for June 17-22 and June 24-26, the courses are aimed at engineers who have a few days to obtain a basic understanding in this field. Further information may be obtained from Prof. L. L. Rauch, Univ. Mich., Ann Arbor, Michigan.



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Business Fliers Learn About Jets From AF

DAYTON (Special)—Air Force took the business aircraft industry by the hand last week and led it across the threshold into the jet age.

Air Force compressed its 15 years of jet experience into an intensive two-day session at the Wright Air Development Center's "Jet Know-How" Symposium for members and guests of the National Business Aircraft Association.

Obviously awed, the business pilots were briefed on a maze of problems accompanying jet operations—ranging from the constant threat of "foreign object ingestion" to need for exact judgment to the threats of hypoxia at high altitudes.

But along with the graphic presentation of the problems, WADC officials spelled out possible solutions—all forming a liberal education for the piston group in the basics of the jet aircraft.

• **Keynoting the symposium,** Brig. Gen. Victor Haugen, acting WADC commander, found a growing awareness of time as a "corporate asset" with "mere air travel" no longer enough. U.S. executives—both from industry and the military—"require and demand fast transportation."

The jet "will open new vistas in business flying," he said, but operators must be cautious. Jets are "ruthlessly unforgiving to moments of lapse," he warned. "Operations are much closer to the margin" and there will be no time "to loiter." But this, and other "inherent" operational problems are greatly outweighed by the advantages to be gained.

Opening the door to high speed, economical executive transport flying, Gen. Haugen said, will be the production of small, lightweight jet engines. Obviously referring to the still classified Fairchild J83 and General Electric J85 developments, he noted that operating costs for the new engines will "compare rather favorably" with present pistons.

The cost of aircraft to be built around these engines was found to be low enough to interest industrial organizations as well as the Air Force. General Haugen told how ARDC first became interested in a jet utility aircraft about three years ago to replace the "antiquated" AF planes such as the B-25.

Initially, paper designs were based on two J47 engines but it was found that any reasonable design would weigh about 45,000 lbs. and thus be far too costly. In the summer of 1955, development of the lightweight engines for the Air Force supersonic trainer provided an answer. The trainer engines "offered interesting possibilities" for the much-sought jet utility planes, Gen. Haugen said.

Although no status report was presented to NBAA on the competition, AMERICAN AVIATION later learned that Air Force does not expect industry to have flying prototypes for another year to 18 months. Manufacturers interested in the projects have anticipated that prototypes could be flying about the end of this year, but as one spokesman put it, "you can't fly a plane without an engine." So far the manufacturers have been given no indication as to when engines would be made available to them.

But the objective of the symposium was to impart knowledge and it was spooned out in articulate dosages, in matters of handling, maintenance, fuels, and physiological effects.

• **Drawing on experience** in the T-33 (which the Air Force felt would be closest to the first jet business aircraft), one spokesman told NBAA that handling characteristics would not be unlike that of modern high-performance piston aircraft. Supersonic aircraft would present major differences but "the advent of the first supersonic business aircraft is considerably in the offing."

However, handling differences will be found. In day-to-day operation, the jet business plane will always be closed to the fuel reserve margin. Pilots will have to receive air traffic clearance before starting the engines. Takeoff will be normal but slightly longer with a noticeably smoother acceleration. There will, however, be noticeable effects of temperature on takeoff distance, i.e., at 40° at 2,800 ft. takeoff distance at 5,000 MSL will be adequate, but at 120° this stretches to 7,400 ft.

For best results on climb, a "virtually constant" Mach Number must be maintained, with cruise pretty much set by Mach Number above altitudes of 15,000 to 20,000 feet. Optimum altitude cruise generally will be above 30,000 feet. Navigation will primarily be conducted by radio aids.

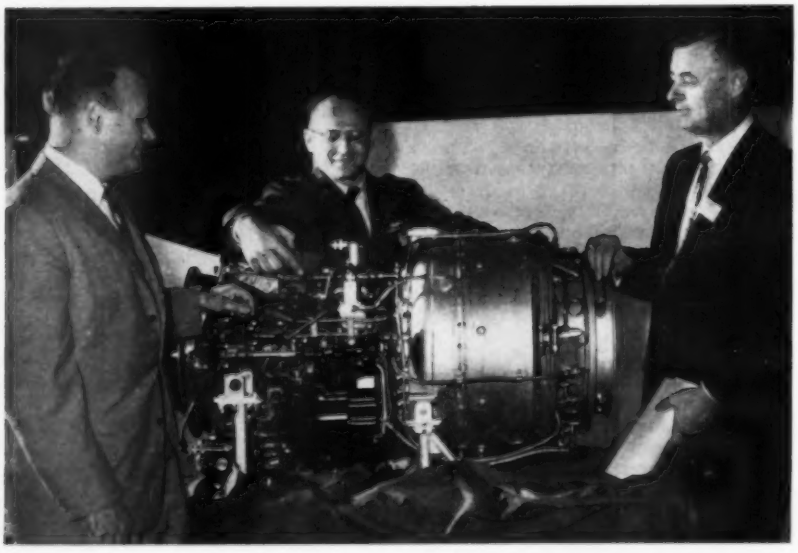
Cold weather operation generally will result in up to 25% increase in thrust at —50°F, with takeoff shorter, acceleration faster and increased landing roll making drag chute or other deceleration device mandatory.

Generally, the Air Force contended jet handling will be "more pleasant" than conventional aircraft. Noise level and vibration will be almost non-existent. Fuel hoarding will eventually become second nature to the pilot, who will find themselves becoming more particular about choice of airports.

Flying a jet, it was pointed out, is much less difficult than commonly supposed. "No one of average flying ability will experience any difficulty in the transition from reciprocating to jet."

A new breed of fuels and oils is required for jet operation. While conventional avgas can be used to power turbine engine, it has been found that it reduces the life of the engine by 10 to 25% if continuously used. AF, therefore, has gone to JP-4.

(*Continued on page* 57)



Most Directly interested NBAA members in the Air Force "Jet Know-how" symposium were the first jet customers for the coming jet business planes. Stephen Brown (l.), chief pilot of Continental Can Co. and C. F. Zimmerman, chief pilot of Continental Oil Co. are the first two of the three customers to sign on the line for Fairchild M-185. The mysteries of the jet engine are being explained by Lt. Col. J. S. Szymkowicz, symposium project officer.

LIFELINE

••• --- ••• These are the "call letters" of the U. S. Coast Guard. Watching over more than half a million square miles of our coastal waters, the rescue record of this famous organization is one of the great air-sea sagas of war and peacetime service. Helping to extend the Coast Guard's far-flung lifeline is the Martin P5M and the new P5M-2G, providing long-range sea reconnaissance for any emergency. Also, in active service with both the Atlantic and Pacific fleets of the U. S. Navy, ten squadrons of this famous seaplane—specially armored for anti-submarine warfare—are in operation today, from Norfolk to the Mediterranean and from Washington to the Orient.

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PAGEOLLEYLAND DIESEL ENGINES

(*Continued from page 54*)

Jets by nature like high altitude and fuel consumption can be reduced by about 17% by flying at altitudes of 30,000 ft. Increases in range at altitude are natural. It was pointed out that the Cessna T-37 at 5,000 ft. has a range of 535 miles but this shoots up to 780 miles at 35,000 ft.

Air Force is using synthetic oils not now available at civil airports. About 75% of the AF turbines are lubricated with synthetics and this is expected to go to 80% or higher next year. But the AF pays in price: $4 per gallon, which is somewhat compensated for by lower consumption requirements. However, it was pointed out, original cost of synthetics was $20 per gallon.

The problem of ingestion of foreign objects into the tailpipe was urgently stressed throughout the meeting. It was revealed that 40 to 50% of all jet engine removal was caused by such ingestion. Filter screens have been found to be partially effective, but the prime answer lays in meticulous runway housekeeping.

Certain medical problems present themselves in jet operations. An Aeromedical specialist found the need for pressurization to 5,000 ft. altitudes, particularly for executives in their later years. Imminence of decompression which can produce near fatal hypoxia (lack of oxygen) will require special oxygen equipment aboard.

The medics recommend: (1) That at least one pilot be on oxygen at all times, or at least be provided with automatic oxygen equipment; (2) an automatic, simple-to-operate system for passengers, with consideration given to the development of disposable masks.

The tone of the symposium was to lay out all the problems in a no-holds bar red approach. But it was not a tone of pessimism, rather one of realism. The problems, it was agreed, are not insoluble but do require new thinking, new procedures, and a new consciousness. It was the general feeling that if faced realistically, the jet age could produce only benefits and increased utility to business plane users. ◈◈◈

Aviation Honors

Robert J. Smith, president of Slick Airways, named Dallas' Aviation Man of the Year for "outstanding achievement in the field of air freight . . ."

Carter Burgess, retiring Asst. Secretary of Defense for Manpower, Personnel and Reserve, and new president of TWA, awarded the Army's highest civilian decoration "for his many outstanding contributions to National Defense . . ."

Roy T. Hurley, president and chairman of Curtiss-Wright Corp., was a recipient of an honor award from Stevens Institute of Technology for "notable achievement" in his chosen field.

W. Paul Eddy, chief of engineering operations for Pratt & Whitney Aircraft, named president of Society of Automotive Engineers.

AAP Elects Three New Vice Presidents

Three new vice presidents were elected at the annual meeting of the board of directors of American Aviation Publications, Inc., on February 8.

They are: Robert H. Wood, editorial director; Robert R. Parrish, managing director of The Official Airline Guide, Chicago; and Fred S. Hunter, west coast manager for the company, Los Angeles.

E. J. Stackpole, Jr., secretary of the company since its founding in 1937, relinquished that position at his own request. Leonard A. Eiserer, executive vice president and treasurer, assumed the additional office of secretary. Wayne W. Parrish was re-elected president and A. H. Stackpole, Eric Bramley and William H. Pearson were re-elected vice presidents. Louis C. James was elected assistant secretary-treasurer.

At the annual stockholders meeting, the board of directors was re-elected as follows: Wayne W. Parrish, E. J. Stackpole, Jr., A. H. Stackpole, Leonard Eiserer, and Eric Bramley.

Top TWA Officials To Report to Burgess

Eleven top company officials have been notified by Carter L. Burgess, new president of TWA, that they will report directly to him.

Included are A. V. Leslie, senior v.p.-finance; E. O. Cocke, senior v.p.-sales; F. G. Betts, v.p.-purchasing; G. H. Clay, v.p.-secretary; J. H. Clemson, v.p.-passenger service; Gordon Gilmore, v.p.-public relations; J. L. Weller, v.p.-planning and coordination; F. E. Busch, v.p.-operations; R. W. Rummel, v.p.-engineering; J. J. Feeney, system director of industrial relations, and A. K. Singer, general communications manager.

The vice presidents of operations, engineering and purchasing formerly reported to the office of the executive v.p. John Collings resigned this position recently. The general communications manager reported to the v.p.-operations.

R. M. Dunn, v.p.-overhaul and maintenance, continues to report to the v.p.-operations; T. K. Taylor and J. W. Thomas, Washington v.p.s, and P. G. Desautels, v.p.-overseas, Paris, will continue to report to board chairman Warren Lee Pierson.

Utility Plane Shipments Up 52% Over 1955

Shipments of utility aircraft in 1956 were 52% over 1955 in both unit production and dollar volume, Aircraft Industries Association said.

A total of 6,738 planes (excluding helicopters and gliders and those produced for the military) valued at $103,791,000 were manufactured by eight companies, against 4,434 valued at $68,258,000 in 1955.

Companies were Aero Design, Beech, Call Air, Cessna, Champion, Mooney, Piper and Taylorcraft. Dollar figure reported is manufacturers' net billing price; retail figure would probably be $130 million, AIA said.

Five manufacturers—Aero Design, Beech, Cessna, Piper and Taylorcraft—of business and utility planes weighing less than 6,000 lbs. (empty airframe weight) reported that they exported 965 units last year valued at $12,467,297. This was 48.5% ahead of 1955 in units shipped and 66.4% ahead in dollar value.

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At Curtiss-Wright's Turbomotor Division—which has augmented operations with new modern facilities at Princeton, New Jersey—engineers are expanding the potentials of turbo power, developing engines for both aircraft and non-aircraft uses. Their answers are contributing to the overall advancement of the science of propulsion . . . continuing Curtiss-Wright's leadership in every major airpower category of today and of the future.

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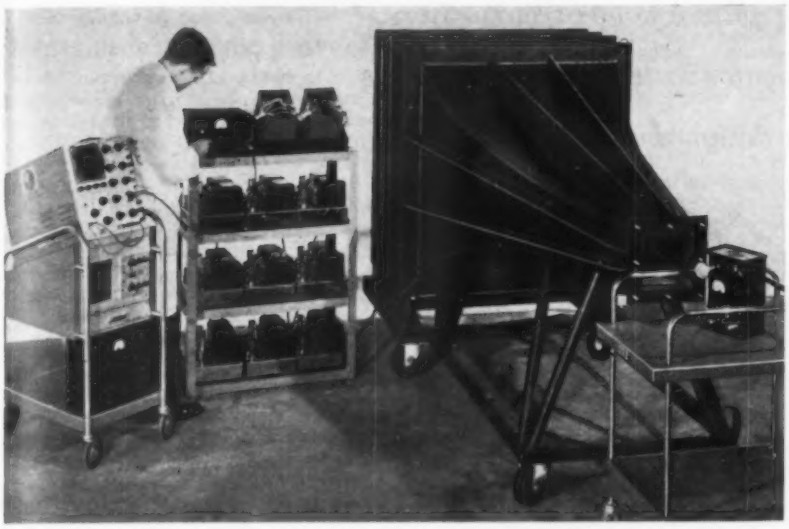
New Products and Processes

'WHITE NOISE' TEST FACILITY



What is described as the first independent commercial "white noise" testing facility on the West Coast has been announced by **Rototest Laboratories, Inc.** With this equipment, a test specimen may be subjected to sound-level intensities of 150 db over a cross-sectional area of 64 sq. in.

This sound level is obtainable on a random-frequency basis covering the entire frequency range from 50 cycles to 10 kc (whence the expression "white noise" is derived) with the required sound pressure level energy present in each octave over the entire range.

Using discrete frequency testing techniques (concentrating available energy at one specific frequency or narrow frequency band) the Rototest equipment can provide sound energy levels from 150 to 155 db.

The "white noise" facility was designed to provide testing conditions in the laboratory comparable to normal flight conditions, with specific reference to white noise conditions.

The equipment has an audio supply of 540 electrical watts, which is converted into sound energy. This in turn is concentrated by use of a logarithmically-shaped sound horn chamber to provide 150 db over a 64-sq.-in. cross-sectional area.

Circle No. 120 on Reader Service Card.

"PREMIUM" PENTODE

U.S. Navy version of the Radio Corp. of America "premium" 5636 sharp-cutoff pentode and designated the 5636-A is now available.

Intended for use in gated amplifier, delay and mixer circuits at frequencies to 400 mc, the tube is rated for service to 60,000 feet altitude without pressurized equipment.

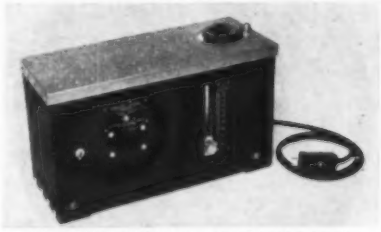
Circle No. 121 on Reader Service Card.

VIBRATION TESTING MACHINE

A vibration testing machine for small items up to 5 lbs. maximum is offered by the **Ahrendt Instrument Co.,** a subsidiary of Litton Industries, Inc. Designated Model 14-28, the unit weighs 30 lbs. and meets frequency and amplitude specifications of MIL-STD-202.

Frequency adjustment is provided from the front and is infinitely variable while the machine is running at 10 to 55 cycles per second. Amplitude setting from 0 to .04" is provided at top right side of the table by means of the eccentric adjustment.

The machine has a variable speed drive mechanism and 1/15 hp split-phase induction motor housed in a cast-aluminum base. Linear sinusoidal motion is imparted to the spring-mounted table by a connecting rod driven by a ball-bearing-mounted eccentric cam.



Circle No. 110 on Reader Service Card.

CABIN AMPLIFIER

Transval Engineering Corp's Aircraft Radio Division has introduced a cabin amplifier that weighs less than 3 lbs. and measures only 3"x7"x3".

Designated TCA-10, the unit is completely transistorized, uses printed circuitry and operates without power supply directly from the aircraft's primary source.

There is provision for two isolated inputs of 500 or 125 ohms. Up to 20 isolated inputs may be used by means of an external resistance network.

The amplifier is rated at 10 watts, with low distortion from 100 to 8,000 cps and output matching speaker impedance of 16, 8 or 4 ohms.

Circle No. 123 on Reader Service Card.

POCKET-SIZE TV-CAMERA

An ultra-miniature TV camera uses a new **Radio Corp. of America** half-inch vidicon camera tube. The JTV-1 weighs less than one pound and measures 1⅞ x 2⅜ x 4½ inches.

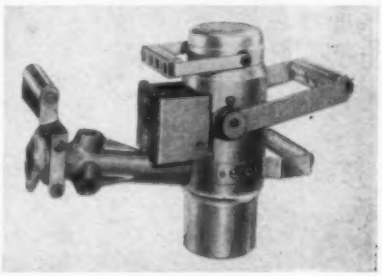
Using an F-1.9 lens, the camera requires 10-ft. candles for operation. A photoelectric iris control is used to activiate specific camera circuits to compensate for changing light levels. Transistors are employed in the circuitry for the unit. The camera system operates from 115 volts 60 cycles and uses less than 350 watts. Camera dissipation is three watts. A pistol grip handle is available.

Circle No. 122 on Reader Service Card.

NOZZLE FOR FUMING ACID

A nozzle with two safety interlocks developed by **Lear Inc.'s Lear-Romec Division** is said to provide maximum protection for persons who service fuming nitric acid.

Designated Model 13110, the nozzle has a teflon gasket flange to which



the vent or fill hoses are attached. To resist the corrosive action of the acid, only the purer aluminums and special stainless steel alloys have been used in its construction. It operates satisfactorily at temperatures ranging from —65° to 140°F and will handle a flow of 100 gpm.

One safety interlock prevents inadvertent opening of the flow control valve before the nozzle is attached and is locked to the adapter on the missile tank. The other prevents unlocking of the nozzle from the adapter while the flow control valve is open.

Circle No. 111 on Reader Service Card.

PULL-TYPE ACTUATOR

A pull-type actuator developed by **The Talco Engineering Co.** is designed to initiate another cartridge-actuated device at the precise time required where a sequence of operations is involved.

Model 1002-1, one of a family of pull-type actuators, was originally designed for use in the Martin P6M1. It is attached directly to the object to be pulled, in this case the locking mechanism of the emergency escape hatch.

The action is initiated by the introduction of gas at a minimum pres-

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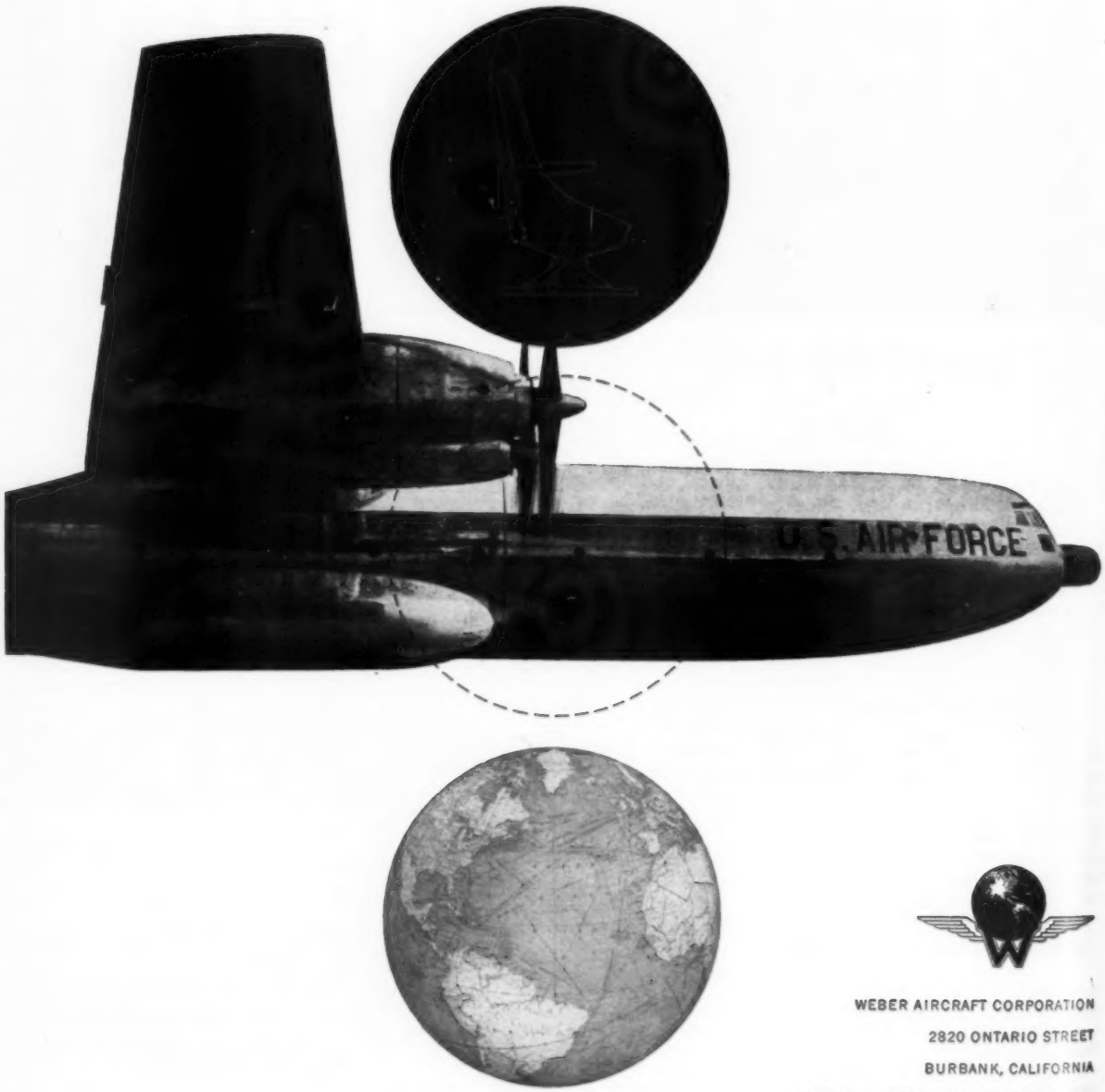
is a giant among cargo carriers.

Navigator seats for these behemoths

are designed and built by Weber.



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GROUND HANDLING EQUIPMENT

ELECTRONIC SYSTEMS

AIRCRAFT SUB-ASSEMBLIES

sure of 500 psi to the actuator's inlet port. This produces a 4,000-5,000-lb. retraction force for the first 11/16" of the actuator's stroke, with a total stroke of 1 to 1¼".

Circle No. 124 on Reader Service Card.

SINGLE-DEGREE-FREEDOM GYRO

An improved single degree of freedom gyro manufactured by **Uniconn, Inc.**, weighs 3 pounds, has a drift rate of 0.030 MR/sec. and gimbal travel of ± 8° max. Run-up time of the unit is 35 sec. max. to 12,000 rpm.

A HIG-5, the model U-105 requires 45 watts at 9.5 volts 400 cps for operation and heater power of 225 watts at 28 volts. Viscous damping is used, and drift rate uncertainty is 0.001 MR/sec.

Circle No. 125 on Reader Service Card.

TRANSISTORIZED HAILER

A portable transistorized electronic megaphone offered by **Telecommunications Ltd.**, has a range of one quarter mile and weighs 5 lbs. Flashlight batteries are used to power the Transhailer and can be expected to last several months in normal usage, equivalent to 20,000 ten-second messages.

Circle No. 126 on Reader Service Card.

MINIATURE TAPE RECORDER

A minature tape recorder developed by **North American Instruments, Inc.**, a subsidiary of Norris-Thermador Corp., is said to have solved the problem of collecting aerodynamic data

from missiles too small for telemetering equipment.

Thus far the Northam recorder has been used principally to obtain skin temperatures during critical periods in high-speed, high-altitude flights. It has gathered vital data from test flights of the hypersonic test vehicle developed by Aerophysics Development Corp. The HTV reportedly has reached 5,000 mph at altitudes in the region of 50,000 ft.

The unit measures 4" in diameter, 5" in height and weighs 2¼ lbs. According to the manufacturer, one Northam recorder has been recovered and re-used eight times in missile tests

Circle No. 100 on Reader Service Card.

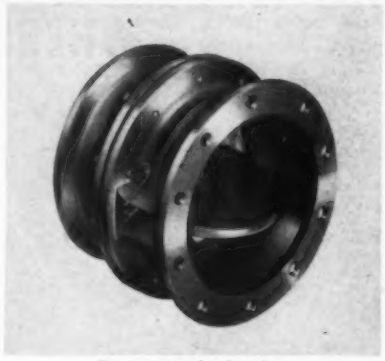
THREE BARBER-COLMAN PRODUCTS

Latest addition to the company's line of temperature control systems is an electronic dual temperature control for the electrically heated windshields of the forward canopy section of a Navy jet fighter. Whenever aircraft power is applied, the controls operate independently to keep windshield temperatures at 100°F.

Three more new products introduced by **Barber-Colman Co.** are a windshield temperature control, a linear actuator and a pneumatic check valve. (This is in addition to five new items described in AMERICAN AVIATION, Feb. 11, pp. 63 and 69.)

Windshield temperature control.

This unit meets environmental requirements of MIL-E-5272a, including 10 Gs vibration. Overall dimensions are 5¼"x2½"x4"; wgt. approx. 2.4 lbs.



Pneumatic check valve.

A double-jackscrew linear actuator incorporates important new design features, including thermal overload protection, integral non-jamming positive stops and a friction clutch. It weighs 4.31 lbs.

A special switch arrangement centers the jackscrews within .02" and maintains a fixed relationship between the switches and jackscrews. Maximum axial load is 150 lbs. tension or compression.

One of several types of pneumatic check valves, illustrated, is a 3" diameter stainless steel unit. Specifications are .05 lb./min. measured internal leakage at 110 psig and 90°F. Designed to meet applicable parts of MIL-E-5272a, the unit weighs 3.1 lbs. Other sizes from 2" to 4" are available.

Circle No. 127 on Reader Service Card.

SUB-MINIATURE BATTERY

A **General Electric Co.** 95-volt silver bromide electrolyte, silver anode, cupric bromide and carbon cathode battery is 31/32" long and 0.335" in diameter. It weighs .15 oz.

Designed for "one-shot" or intermittent applications, or for service as a bias supply, the battery will withstand temperatures from —100° to +165°F. Available charge is 1 coulomb. Flash current is 8 microamperes. The unit has a projected shelf life of more than 20 years.

Circle No. 128 on Reader Service Card.

CATALYTIC FILTERS

Catalytic filters developed by the **Mine Safety Appliances Co.** are being used for decontaminating air bled from jet turbo-compressors of Boeing B-52s for pressurizing the cabin.

The catalytic material was originally developed for gas masks. Nearly 100 different types of material were investigated before the solution was found by studies conducted at the U.S. Bureau of Mines and the Mine Safety Appliances Co.

Contaminants in the air bled from jet turbo-compressors are mostly carbonyls, including aldehydes, ketones and organic acids. The catalyst causes oxidation of aldehydes and other hydrocarbons into harmless carbon dioxide and water vapor.

The filters are being supplied in three standard sizes, for 100 to 600 cu. ft. per min. of air flow. Other sizes will be available.

Circle No. 129 on Reader Service Card

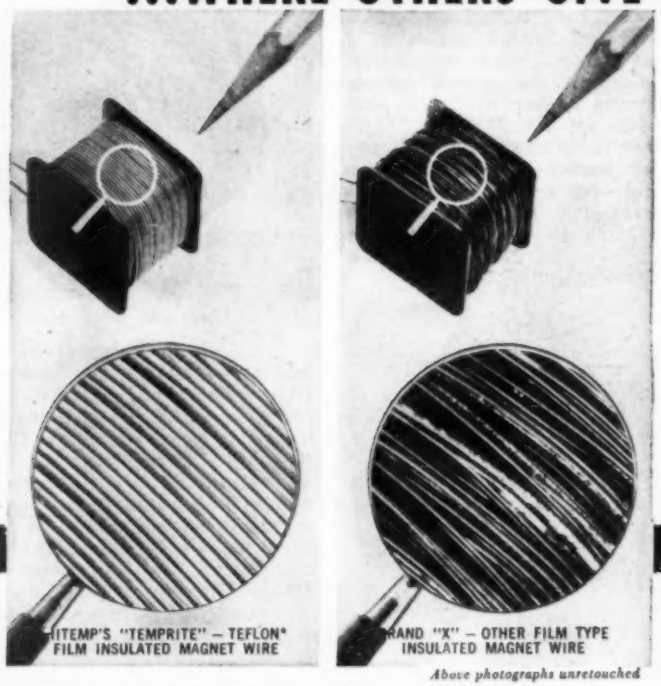
SILENT DOOR LATCH

A door latch with a bolt and hub bearings of nylon and aluminum knobs is said to eliminate the annoyance of rattles and buzz heard in aircraft at different critical speeds. **Adams-Rite Manufacturing Co.** believes it will solve another problem of high-speed jet aircraft.

The nylon bolt is used in the Model 1979 latch because self-lubricating characteristics of nylon prevent the rattling and squeaking encountered from metal bolt locks.

Instead of sliding onto the spindle and being fastened with a set screw, both knobs are screwed onto the spindle until they are snug against the hub, then secured with Nylok set

HITEMP WIRES STAND UP ...WHERE OTHERS GIVE UP



HITEMP'S "TEMPRITE" — TEFLON* FILM INSULATED MAGNET WIRE

ANY BRAND "X" — OTHER FILM TYPE INSULATED MAGNET WIRE

Above photographs unretouched

IN MAGNET WIRE FOR COMPONENTS

THERMAL TEST: 168 HOURS AT 500° F.

The above illustrations clearly show the tremendous thermal advantage of Hitemp's "Temprite," Teflon* insulated magnet wire, over the best of other film-type insulations. Here is a true Class H magnet wire, with an amazing upper temperature level of 500° F.

Ask yourself! How will the component I manufacture be used? If your coils, relays, transformers, motors etc. must withstand today's high temperatures and frequencies; if moisture, chemicals or solvents will be encountered; if abrasion resistance and film continuity are a must or if miniaturization is important... Hitemp's "Temprite" must be specified.

For maximum reliability and unequalled performance specify "Temprite" . . . the magnet wire made to exceed the requirements of military specification MIL-W-19583. Available in sizes 14 to 50 AWG inclusive and in single, heavy, triple and quadruple thicknesses.

For further information call or write your nearest Hitemp Wires, Inc. representative or sales engineer today!

Leading Specialists in High Temperature Insulations

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Birmingham 9, Alabama

WRIGHT FIELD
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Dayton 2, Ohio

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Jim Morrow Sales
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Highland Park, Mich.

INDIANA
Richard C. Warner
Box 338
South Whitley, Ind.

ILLINOIS, WISC. & IOWA
Caine Sales Company
3020 North Cicero Ave.
Chicago 41, Illinois

*Du Pont's Trade Name for POLYTETRAFLUOROETHYLENE

Circle No. 11 on Reader Service Card.

screws. Washers may be used if needed.

A variety of finishes are available to customer's specification.

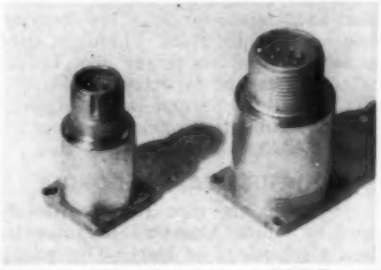
Circle No. 130 on Reader Service Card.

INDICATOR SWITCH

An indicator switch that signals when a valve has completed its closing or opening cycle, designed for use in aircraft and missiles, has been introduced by the Bridgeport Thermostat Division of **Robertshaw-Fulton Controls Co.**

The Capswitch indicator is being used on propellant valves for malfunction analysis by a leading manufacturer of rocket engines, according to Robertshaw-Fulton. It is said to be adaptable to any type of control where repeatability within ±.001" is desired.

Two models are available. The 65M41 is of the SPDT type and weighs



.095 lb. The 65M83 is a DPDT type weighing .19 lb.

The indicator is mechanically actuated by a sealed plunger that is depressed by the valve stem, thus closing and/or opening control circuits.

Circle No. 104 on Reader Service Card.

MINIATURE COOLING FAN

Rotron Manufacturing Co. has introduced a miniature cooling fan of the vane-axial type for missile applications.

Motor is of inside-out construction, with the electrical rotor and air-moving impeller integrally cast in one piece. The unit measures 2" in diameter and 1½" in length and weighs only 4 oz. It moves 62 cu. ft. per min. at

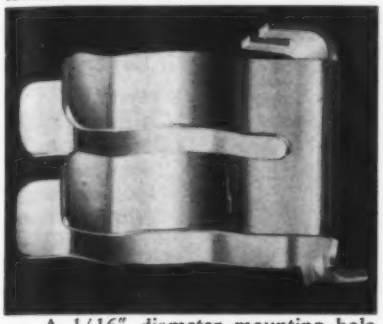
free delivery and 43 cfm at 2" static pressure.

The fan operates at 20,000 rpm and is wound for 400 cps only, either 200-volt, 3-phase or 115-volt, 1-phase. Both types have an input of 45 watts. Fitted with solder-type hermetic terminals rather than leadwires, the fan may be inserted airtight in a closed piping system.

Circle No. 105 on Reader Service Card.

TRANSISTOR CLIP

A silver plated beryllium copper clip manufactured by **Atlas E-E Corp.** that holds all transistors of 0.235" x 0.375" size is split to insure a four-point tight grip. A stop prevents longitudinal movement.



A 1/16" diameter mounting hole is used with an integral tab to prevent twisting of the clip.

Circle No. 131 on Reader Service Card.

SELCAL GROUND STATION

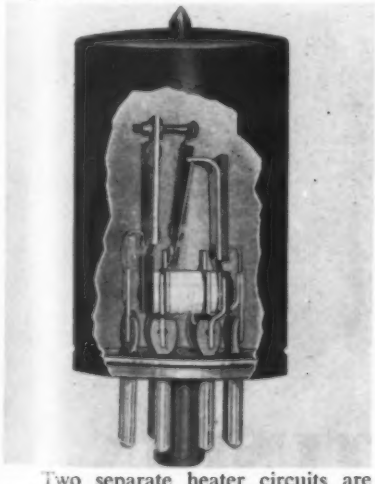
Motorola, Inc's new SELCAL single-package ground station was designed as a compact single-package unit that combines tone generator, timer, power supply and code selector elements in one unit.

For the first time, simultaneous signalling on several transmitters from a number of operator positions is permitted and is used to eliminate time lost waiting to employ a common tone generator. Each position is entirely independent and does not require interposition cabling. Either rack or a cabinet-mounted unit is available.

Circle No. 133 on Reader Service Card.

THERMAL MEMORY RELAY

A thermal memory relay developed by **Curtiss-Wright Corp.'s** Electronics Division is a bistable time delay unit with single-pole, double-throw snap-action contacts.



Two separate heater circuits are used to transfer a movable arm from one contact to another. The relay remains in either of the two contact positions until operated by means of the appropriate heater circuit.

Operating time is either 20 or 30 seconds on both transfers. The units are temperature compensated from —55°C to +100°C and have standard voltage rating of 6.3, 26.5 or 117 volts. Other voltages are available. Heater power is 2.7 watts for each heater.

Circle No. 132 on Reader Service Card.

INSTRUMENT TRANSLATOR

Crescent Engineering & Research Co. has developed a transistorized instrument translator that is said to solve the problem of how to substitute variable reluctance electro-mechanical pick-offs for potentiometers in aircraft and missile systems without adding considerable size and weight to the electrical equipment.

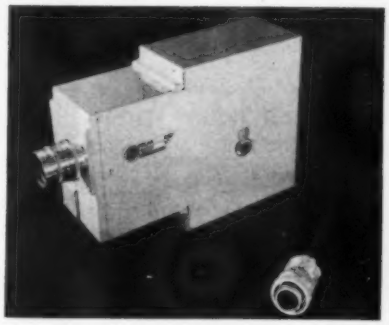
The translator receives power from the system source, whether ac or dc. When connected with a suitable ac sensing transducer, it produces a dc or ac signal proportional to the physical changes sensed by the transducer.

Various models are available to operate meters, recorders, hydraulic valves, servo motors, etc. A thick-walled anodized aluminum housing and potted interior enable the unit to withstand rugged environmental conditions without damage.

Circle No. 107 on Reader Service Card.

PHOTOGRAPHIC RECORDER

The Vought Co.'s new VDR-52 16mm high-speed photographic data recorder has a film capacity of 200 ft. and is capable of recording up to 200 frames per second. Power requirement is 28 volts dc.



Another model, the VDR-42, similar in shape, is pulse-operated at speeds up to 10 frames per second or cine operation at 16 frames per second. Other smaller models in production will have a 100-ft. film capacity.

These recorders are designed especially for use in aircraft and missiles.

Circle No. 106 on Reader Service Card.

DRY AIR PUMP

A positive displacement dry air pump developed by Pesco Products Division, **Borg-Warner Corp.** incorporates patented features at tips and ends of impellers to provide virtually zero

The NEMS-CLARKE Shieldmounts, designed and manufactured by us, have become the standard for the industry. All types are recommended by equipment manufacturers because of these features: Spring temper phosphor bronze, obtainable silver plated, blackened or unfinished • perforated for riveting directly to chassis or terminal board • excellent heat dissipating qualities.

NEMS-CLARKE has the facilities to design and produce equipment to your specifications.

NEMS CLARKE
Incorporated
919 JESUP-BLAIR DRIVE SILVER SPRING, MARYLAND
For further information write Dept. T-4

Circle No. 12 on Reader Service Card.

Now, after five and one-half years of persistent development, uniformly controlled shapes of highest quality and strength at low mass cost.

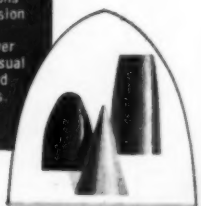
Already in production for the Air Force, Navy, Army, and civilian contractors are aircraft fuel tanks, containers for missiles, minesweeping floats, and other components.

amazingly **PRECISE** *laminates are coming out of Pastushin's* **GFR* "CAROUSEL"**

The exclusive Pastushin GFR "carousel" can rotate six molds automatically to provide extraordinary uniformity and precise tolerances by its centrifugal action. Painstakingly engineered to distribute controlled amounts of resin and chopped fibers simultaneously, the "carousel" turns out GFR parts 44"x 10', one every ten minutes, with a single operator. It accurately forms parts "out of round" as much as 20% between major and minor axis, and can mold integral stiffeners into parts automatically.

*GFR MEANS GLASS, FIBER, RESIN

GFR jettisonable fuel tank sections offer high corrosion resistance, uniformity, lower tooling costs, visual fuel check, and other features.



Pastushin high-uniformity radomes are being developed beyond the prototype stage.

Among GFR shapes in production are containers ten ft. long and 44 in. in diameter (with even larger possible), for storing and transporting missiles and other material.

PASTUSHIN
AVIATION CORPORATION

5651 WEST CENTURY BLVD., LOS ANGELES, CALIFORNIA

AFFILIATED COMPANIES:
PASTUSHIN INDUSTRIES, INC., LOS ANGELES · HAWAIIAN AIRMOTIVE LTD., HONOLULU

Circle No. 13 on Reader Service Card.

clearance without rubbing.

Designated Model 133218, this oil-free air pump weighs 5 lbs. 10 oz., is rated at 40 cu. ft. per min. zero pressure delivery or 30 cfm (free air) 10 psi delivery at 7,500 rpm. Higher pressures can be attained and pump speed increased if more flow is desired.

As supplied to the Air Force for inflating paraballoon radar installations, it is equipped with an air cleaner and a 400-cycle ac Pesco electric motor.

Circle No. 103 on Reader Service Card.

ARMING SOLENOID

Type PA-1193 arming solenoids offered by the Pacific Division of the **United Transformer Corp.** are designed for aircraft applications.

The arming pin projects when the solenoid is energized (15.5-28 volts dc) and will support a 100-lb. ring-hung load. When the solenoid is de-energized, the pin retracts under a 5-lb. ring-hung load.

Dimensions are 1.6″ by 0.9″; weight, 4 oz. The unit meets MIL-S-4040A and MIL-E-5272A specifications.

Circle No. 102 on Reader Service Card.

DIAPHRAGM SEAL

A diaphragm seal for the specific requirements of aircraft, missile and other manufacturers using JP-14 and other similar fluids at extreme temperature ranges has been developed by the **Bellofram Corp.**

Impregnated with a fluro-silicone rubber, the seal is usable at temperatures ranging from —80° to 400°F. This type of rubber is said to make long-stroke, frictionless power available at extreme temperatures in connection with solvents never before possible. It is expected to have many applications in fuel hydraulic metering, measuring and controlling.

Circle No. 108 on Reader Service Card.

OSCILLOSCOPE

The **DuMont** Type 403 oscilloscope is said to be the most sensitive commercially available scope. It features a full-scale amplitude measuring range from one milli-volt to 500 volts and can resolve a 20 microvolt signal.

Especially designed for reading directly microvolt outputs of strain gages, pressure pickups, accelerometers and other transducers, the instrument has front panel controls that permit selection of 19 linear sweeps from 0.5 sec. per. cm. to 0.5 microseconds per cm.

Both driven and recurrent sweeps are available with automatic beam-brightening during trace time. Weight is 40 lbs. The unit is available for rack- or case-mounting.

Circle No. 134 on Reader Service Card.

SET OF WRENCHES

In cooperation with Cannon Electric Co. engineers, the **Spec Tool Co.** has developed a set of wrenches that greatly facilitate assembly or disassembly of AN connectors.

These wrenches are light, compact and easy to handle and may be taken to the aircraft or missile, permitting the connector plug to be disassembled on the job rather than taking it to a vise and possibly damaging it. The Spec tools also permit the "clock" in-

A little pull in the right place . . .

the ROBINSON wire twister

Aircrafts' Who's Who Reports

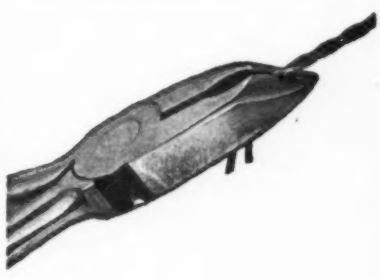
A cross section of the Who's Who in the aircraft industry—including Douglas, Allison, Fairchild, Grumman, Martin, Republic, Canadair Ltd., Pratt and Whitney among a host of others — is reported to have reduced engine wiring time as much as 66%. This saving is effected by the use of the new Robinson Wire Twister, an improved model of the ones that have seen service with the army, navy and airforce since 1943. Improvements include the exclusive diagonal jaw design that permits easier access to hard-to-reach areas, and clamps a vice like grip on the wire by pulling it into a 30° bend thus delivering added leverage for twisting.

In addition to the greatly increased engine wiring speed, users attest to improved shop safety — fewer skinned knuckles and bruised fingers.

Besides their production line assignments, Robinson Wire Twisters readily adapt in the shop to bench work, on radio and radar equipment, on magnetos, carburetors, instruments and sub-assembly work of all kinds.

List price is $18.50. Write for fully descriptive literature to Ralph C. Robinson Company, Dept. M, Box 3494, 2516 Crosby Way, North Sacramento 15, California.

Circle No. 14 on Reader Service Card.



. . . saves ⅔ the usual wiring costs

the ROBINSON wire twister

FOUR JET CAR

Helpful Hot Rod

The hottest hot rod on wheels today was developed by All American. But far from being a threat to life and limb this hot rod is used to *save lives.*

Powered by four jet engines, the car makes speeds of more than 200 miles per hour and is used to simulate a landing jet aircraft. Its main purpose is to drive loads at high speeds into aircraft arresting gear to test the strength and durability of the gear. On how well these arresting gear hold up may depend the life of an Air Force or Navy jet pilot.

The jet car was All American's answer to the difficult problem of how the speed of a landing jet aircraft can be attained on the ground with a load equal to the weight of an airplane. This and other tough problems for the Armed Forces and industry are All American's business.

Every engineering idea receives consideration at All American.

Engineers who can tackle these vital problems with a spirit of daring and imagination contact Walt Jones, Personnel Manager, All American Engineering Company, Box USS 2668, DuPont Airport, Wilmington 5, Delaware.

RESEARCH • DESIGN • MANUFACTURE

All American Engineering Company

DUPONT AIRPORT • WILMINGTON, DELAWARE

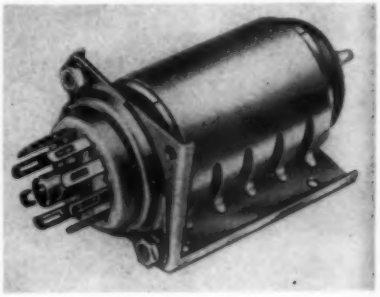
dexing of the connectors. Each wrench will handle 12 sizes.

The company says the savings in time and in damaged connectors has brought about wide acceptance of the wrenches in the aircraft industry and of repeat orders from users.

Circle No. 101 on Reader Service Card.

TUBE SHIELD MOUNT

An **International Electronic Research Corp.** heat-dissipating tube shield mount for miniature electron tubes has a right-angle mounting bracket and socket. For all sizes of 7 and 9-pin miniature tubes, the new assembly features soft silver or copper wrap-around for the glass bulb and a separate beryllium copper spring clip for tube retention.

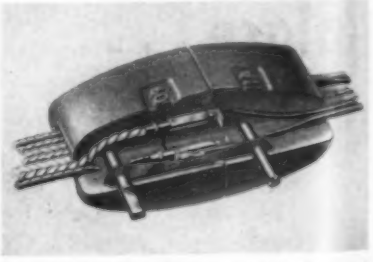


Designed to serve a greater variety of mounting applications, the mount has a solid copper slug assembled between the right angle base and shield wrap-around to insure maximum contact and heat conductivity. The socket may be oriented to any one of four positions to meet layout needs.

Circle No. 135 on Reader Service Card.

INTEGRAL MOLDED INSULATION

A new technique for producing molded unit cables has been developed by **Alden Products Co.** and will be shown at the Institute of Radio Engineers show in New York March 18.



Called the Alden "IMI" (integral molded insulation) conductor technique, contacts and leads are molded with one hot shot of connector insulation into connector bodies integral with their cables.

The designs are said to eliminate tedious assembly operations, reduce the parts in connector designs to a minimum, provide positive moisture seal and protection for leads, contacts and all current-carrying parts from shock and vibration.

Literature is available.

Circle No. 165 on Reader Service Card.

New Product Briefs

• **Spencer Thermostat Division,** Metals & Controls Corp. is producing roller and leaf actuators for Klixon KX4 sine switches, designed for use in aircraft, missiles and other applications. Current ratings are 10 amps., resistive, 115 volts ac/ 30 volts dc.

Circle No. 175 on Reader Service Card.

• **Hitemp Wires, Inc.** has introduced a new line of inks for permanent printing on teflon-insulated wires and cables, said to be unaffected by extreme temperatures ranging from —90°C to 250°C and inert to all known commercial solvents and chemicals.

Circle No. 176 on Reader Service Card.

• **Turco Products, Inc.** has developed two finishing processes designed to provide magnesium with better corrosion-resistance, abrasion-resistance and paint-bonding properties. Both processes have been approved for use by the Magnesium Division, Dow Chemical Co.

Circle No. 177 on Reader Service Card.

• **The Palnut Co.** offers Type H pushnut fasteners for unthreaded studs of die-cast name plates, medallions, grilles and ornaments, made of 410 stainless steel, for applications requiring high corrosion-resistance.

Circle No. 178 on Reader Service Card.

• **Opad Electric Co.** is producing a voltage control unit for testing ac-operated aircraft equipment and components. It operates on 115 volts, 400 cycles, single phase and provides a continuously adjustable output from 0 to 115 volts under a maximum load current of 15 amps.

Circle No. 179 on Reader Service Card.

• **G.M. Manufacturing Co.** has developed a hydrometer syringe of the twin-tube type (patent pending), trade-named Gemware, for measuring the weight of fuel oils pumped into aircraft tanks.

Circle No. 180 on Reader Service Card.

• **Haydon Switch, Inc.** offers a limit switch, #9135, with many applications. It has a 360° rotary action with 180° pre-travel and 180° over-travel, operates at 28 volts dc or 110 volts dc with a 10-amp. resistive rating. 4 amps, inductive. Rated life, 100,000 cycles.

Circle No. 181 on Reader Service Card.

• **Graham Transmissions, Inc.** has developed an infinitely variable speed drive for Air Force ground checkout and test equipment, said to be particularly suited for use on tachometer, gyro and accelerometer testers as well as integrating devices and other similar apparatus. Sizes from 1/15 to 1/2 hp with torques up to 750-in./lbs. are offered.

Circle No. 182 on Reader Service Card.

• **Scott Aviation Corp.** has introduced an automatic compensating exhalation valve for its Scottoramic masks. The valve automatically balances inlet and outlet pressures to provide both safety and positive operation.

Circle No. 184 on Reader Service Card.

West Coast Talk . . . By Fred S. Hunter

• Small boys: big problem for stewardesses.

• Douglas' proposed STOL transport designed for Navy.

STEWARDESSES—or hostesses, as TWA prefers to call them—are generally radiantly enthusiastic about their flying jobs. When you hear one complain, it probably will be in this order: 1) all the pilots are already married; 2) kids (masculine gender). Imagine the horror of one stewardess when she observed little Frankie throwing his weight on the handle of an emergency exit. And the exasperation of another when little Johnny refused to fasten his safety belt and his mother blandly explained: "Johnny doesn't like it." But the stewardess who found little Billy making a shambles of the lavatory on a trip we happened to be aboard the other day knew just how to handle his kind. Out . . . by the ears.

Hunter

* * *

More dollars for missiles and fewer for aircraft is having its effect on the accessory business. Missiles have fewer accessories. There's less profit—or perhaps we should say it is more difficult to return a profit—on those they do have. This intensifies the need for ample capital. Observers expect the merger pattern of 1956 to continue even stronger in 1957.

* * *

Parking space closest to the door at Hughes Aircraft Co.'s crowded parking lot in Culver City is reserved for Noah Dietrich. Next adjoining space carries the name of vice president and general manager E. A. Hyland. Nowhere is space marked off for Howard Hughes. But, somehow, we have an idea it doesn't matter. There'll be a space anytime Mr. H. appears.

* * *

Hamilton-Standard has caught on in the jet transport field, where there are no propellers, by landing the order for refrigeration and pressurization equipment for the Convair 880. AiResearch will supply the controls and valves.

* * *

Douglas Aircraft's proposed four-engine turboprop STOL transport is designed to meet a Navy requirement for a personnel and cargo transport that can be operated on the deck of a carrier. It would be about the size of a DC-4—60,000 pounds gross—but higher power of the turboprops and light wing-loading would provide short takeoff and landing characteristics that may well appeal to other military services, too.

* * *

Impression is around that the Air Force is shelving the WS-110A chemical bomber project (Boeing vs. North American), but what's actually happened, apparently, is the study stage has been extended a year. This may merely be postponing the agony, but a lot can happen in a year's time, and the project might even get hot enough for go-aheads for both companies.

* * *

Solar's Fred Hage has a neighbor in San Diego, a lady in her 80s, who is anxious to have him pass along her suggestion to these jet pilots who set off sonic booms in "breaking the sound barrier." Why don't they just go around it?

* * *

Northrop Aircraft has taken a lot of abuse on the Snark, but it looks to us as though the boys out Hawthorne way have the last laugh, now that it's been officially disclosed the missile is definitely going into the Air Force inventory. That means money in the bank.

* * *

Allison is setting up a parts program on its 501-D13 turboprop —pardon us, propjet—engines so that airlines buying Lockheed Electras will only have to maintain a 30-day inventory of spare engine parts. That's money in the bank, too —for the operators.

* * *

Looks like the Air Force might come to a decision on a new type interceptor very soon now. This has been hanging fire ever since termination of the original long-range interceptor competition between Northrop and North American after the rapidly changing military picture left the Air Force uncertain as to exact needs. But the other day an Air Force board headed by Maj. Gen. Al Boyd was on the coast to evaluate proposals submitted by Convair, Lockheed, North American and Northrop and bring in a recommendation. Republic is also in the running.

Douglas Aircraft estimates the market for big jet transport will produce 150 to 225 more sales between the three companies, Boeing, Convair and Douglas.

International Aviation

By Anthony Vandyk

Canadair's Argus Patrol Bomber

For those who know Canadair it was no surprise that the Montreal company managed to roll off its final assembly lines the first CL-28 patrol bomber exactly according to a schedule set almost three years ago.

Canadair has established an enviable record for meeting its production commitments on time. Until Douglas delivered DC-7Cs to BOAC ahead of schedule last year, Canadair was the only aircraft manufacturer to have supplied any postwar BOAC-type of aircraft at the time promised in the contract. The aircraft in question was the Argonaut which is better known in North America as the North Star.

It is very similar to the Douglas DC-6 but uses Rolls-Royce Merlins instead of P&W R-2800s. Pressurized versions are in large-scale service with Trans-Canada Air Lines and BOAC while an unpressurized version of the aircraft is the backbone of the RCAF's transport fleet.

Since the last Argonaut was produced several years ago, Canadair has been out of the big aircraft picture. Most of its bread and butter has come from the F-86 Sabrejet. Some 1,600 of these fighters have been produced to date. Second most important production item has been a Nene-powered version of the Lockheed T-33 trainer.

• **The CL-28** brings Canadair back into the big aircraft field with a model that is the biggest plane ever built in Canada. Is also returns Canadair to the transport field. The CL-28, named the Argus and designated CP-107 by the RCAF, is primarily designed as a patrol bomber. However, all the complex electronic equipment can be removed and, if required, the aircraft can carry 102 passengers across the Atlantic non-stop.

The chances seem good that the RCAF will order a transport version of the CL-28, designated CL-44, and that the aircraft will eventually be bought by commercial customers.

The CL-44 as a commercial transport will complete an unusual design cycle. The CL-28 is basically a converted Britannia transport. The Bristol wing and tail together with many other features were retained but a new fuselage suitable for patrol bomber missions was substituted for the transport type fuselage of the Bristol aircraft. Furthermore, Wright turbo-compound engines were substituted for the Britannia's Proteus turboprops.

The CL-44, however, will go back to the transport-type fuselage and the turboprop powerplant. Since the transport will not be built for perhaps a couple of years, Canadair will use a more advanced turboprop than the Proteus—probably the BE-25 Orion, the engine which will be fitted retroactively to BOAC's Britannia 310s and eventually will go into production aircraft coming off Bristol's line.

Canadair's CL-28 Argus patrol bomber has little resemblance to Bristol Britannia from which it was derived. A transport version, the CL-44, will go back to original British design complete with turboprops. CL-28 has Wright Turbo Compounds.

Japan Air Lines Plans to Double Fleet To 33 Aircraft, Girdling Globe by 1965

Details of a ten-year expansion program disclosed by Japan Air Lines show that by the end of 1965 it plans to be girdling the world with a fleet of 33 aircraft, more than double JAL's present fleet.

The first step will be in the increase of transpacific flights from four to five this spring. This will be stepped up to six flights early in 1958 when DC-7C equipment will be introduced on the route.

JAL also hopes to be allowed to start service to Los Angeles in 1958 with three of the six flights routed to San Francisco via the Southern Californian city.

Also in 1958 JAL will start a thrice-weekly service from Tokyo to Manila and will include Taipei on two weekly flights to Hong Kong. Service to Bangkok will be stepped up to thrice weekly. Provided that relations with Communist China permit, JAL will establish a twice-weekly service to Peking and Shanghai.

• **Plans for 1959** include two important new services—Tokyo-Seattle (thrice weekly) and Tokyo-London (weekly). The latter route will be operated via Hong Kong, Bangkok, Calcutta, Karachi, Beirut, Rome and Paris. In 1959 the Tokyo-Sao Paulo, Brazil, route will be flown on a monthly basis. During the year two additional DC-7Cs will be delivered bringing JAL's DC-7C fleet up to six aircraft.

No route changes are scheduled for 1960, the year when JAL receives its four DC-8 jet transports. Early in 1961 frequencies of the Tokyo-London and Tokyo-Sao Paulo routes will be stepped up to twice weekly and weekly, respectively. The Tokyo-Manila route will be extended to Singapore and Jakarta twice weekly.

In 1962 frequency increases on most routes are planned while in 1963 a new route to London will be opened via Peking and Moscow to operate on a weekly basis. Frequencies on this route and on the Seattle run will be increased during 1964. These two routes will be extended to New York in 1965, thereby enabling JAL to girdle the world. At that time the carrier will have a fleet of 33 Douglas aircraft—DC-8s, DC-7Cs, DC-6Bs and DC-4s.

AIRLINE BRIEFS

Swissair plans to extend its South American route to Buenos Aires April 8. In July DC-7Cs will replace DC-6Bs on this service . . . **South African Airways will open a new route to London via the West Coast of Africa on April 1. There will be two flights weekly. Three flights will be operated over the old East Coast route . . . Tasman Empire Airways** has started a weekly service from Auckland, New Zealand, to Melbourne, Australia, bringing to four the routes operated by the carrier between New Zealand and Australia.

Linea Aerea Nacional of Chile has ordered four more DC-6Bs, bring its total DC-6B fleet to seven aircraft . . . **Linee Aeree Italiane** has increased its Viscount order from six to ten aircraft. The first six will be delivered from April to August 1957 and the remainder in March and April 1958 . . . **Lufthansa** German Airlines has ordered three more Convair 440 Metropolitans and two more Viscount 810Ds. It had previously ordered two Metropolitans and seven Viscounts . . . **KLM** will substitute DC-6s for Convair 340s on its Miami-Curacao-Caracas route this fall . . . **Panair do Brasil** is reported to be planning to buy four more DC-7Cs and four Boeing 707s. It has four DC-7Cs on order already . . . **De Kroonduif,** KLM subsidiary operating in Dutch New Guinea, has bought three Scottish Aviation Twin Pioneers.

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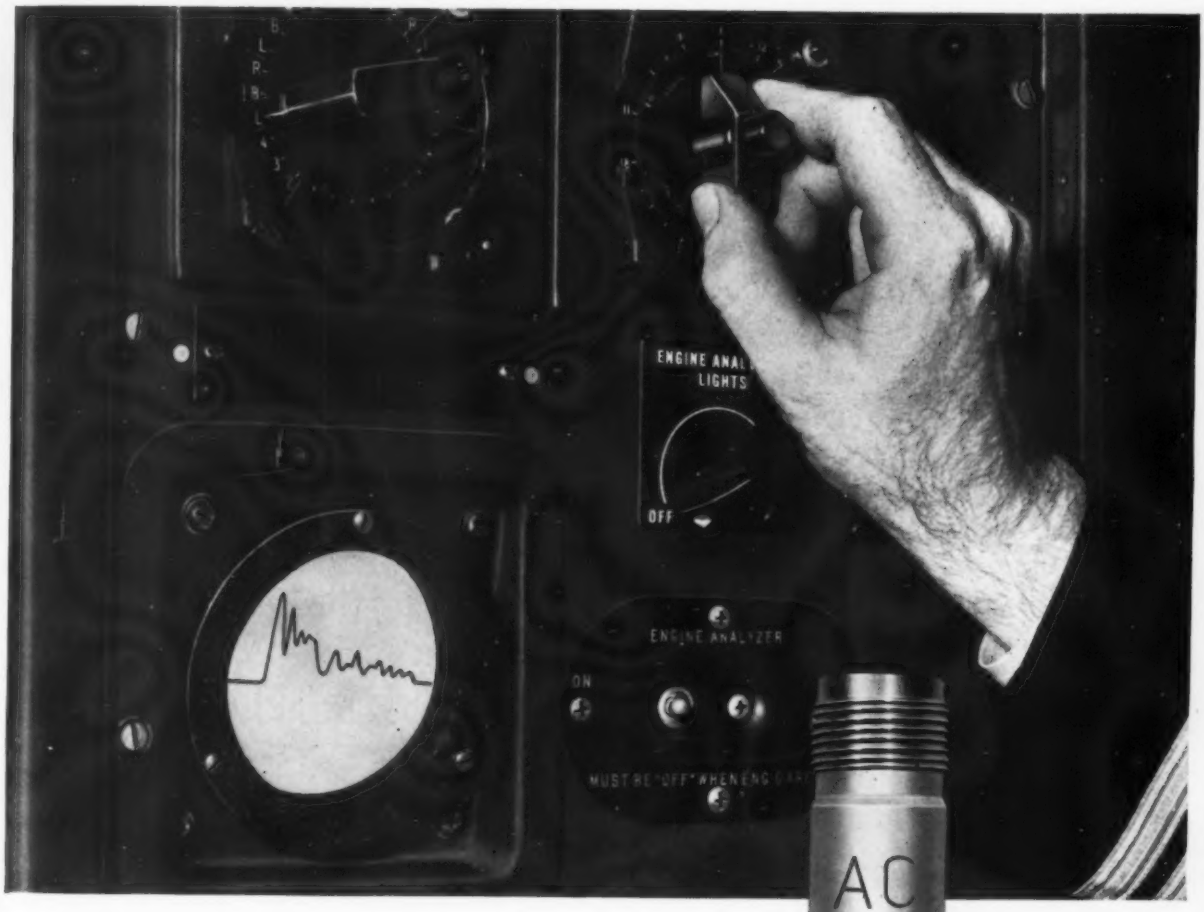

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MANUFACTURING

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Henri Ziegler	President Breguet company	President, RBV-RI electronics company
Harry E. Pinkerton	President, Intercontinental Electronics Corp.	Engrg. mgr., Airborne Instruments Laboratory
Robert A. Cole	Chief engnr., Tally Register Corp.	Supv. computation and data processing, Boeing's Bomarc missile project
Raymond J. Condon	VP for govt. projects, Aeronautical Div., Minneapolis-Honneywell	Mgr., military sales
Donald L. Leavitt	President, Airaterra (new corp. of Roylyn, Inc.)	President, Roylyn, Inc.
Alfred H. Grebe	Chief R&D engng., Filtors, Inc.	R&D engnr.
Ray Goudeau	Sales mgr., Delta products and AMC supply divisions, Air Accessories, Inc.	Sales engnr.
Basil Blackwell	Asst. chief engnr., Bristol Aero-Engines Ltd.	In chrg., Blade Engrg. Dept.
Arthur W. Fox	VP, Camloc Fastener Corp.	Dir. of sales
Paul Jennings	VP, Camloc Fastener Corp.	Mgr. west coast office
William C. Davis	Chief engnr., Aeronautical Div., Sun Electric Corp.	Functional test equipment engnr., Lockheed
Paul Schratter	Adv. and sales promotion mgr., Aircraft Accessory Turbine Dept., General Electric Co., Lynn, Mass...	
Harry N. Bedford	Mgr., industrial engrg. dept., Aeronca Mfg. Corp.	Insulator dept., Baltimore Mgr. production control, Bausch and Lomb Optical Co.
Ernest Hemphill	Editor, Canadian Aviation	Associate editor
William W. Bumpus	Gen. mgr., sales div., Hycon Eastern, Inc.	Consolidated Electro-dynamics Corp.
Robert P. Gira	Gen. sales mgr., Topp Industries, Inc.	Sales mgr., mfg. div.
Edward D. Jackson	Mgr., Axelson Aviation, Axelson Mfg. Co.	Gen. sales mgr., Axelson Mfg. Co.
Wayne M. Pierce, Jr.	VP-engrg. and mfg., Norden-Ketay Corp.	Dir., mfg.
Richard A. Maher	Chief engnr., Hoffman Laboratories, Inc.	Mgr. engrg., govt. and industrial div., Philco
C. E. Pappas	Asst. dir. scientific research, Republic Aviation Corp.	Chief of aerodynamics and thermodynamics
Samuel E. McMillan	Project mgr., F-105, Republic Aviation Corp.	Chief auditor
B. F. Coggan	VP and mgr., Convair-San Diego	Mgr., Convair-San Diego
Charles F. Horne	VP and mgr., Convair-Pomona	Mgr., Convair-Pomona
Raymond W. Ayres	Sales mgr., Revere Corp. of America	Mgr., industrial div., North Electric Co., Galion, Ohio
Kenneth C. Meinken, Jr. ..	Exec. vp, Electronic Tube Corp.	VP and sales mgr., General Instrument Corp.
Philip K. Reily, Jr.	Asst. to the president, Atlantic Research Corp.	Supv., solid propellant information agency, Applied Physics Lab. Johns Hopkins Univ.
Alfred Goldberg	VP, Long Beach Aeromotive Co.	Head, maint. and engrg., Trans American Airlines
Robert L. Graham	Adv. mgr., Ford Instrument Co., div. of Sperry Rand Corp.	Sales promotion coordinator
Les Rossi	Publicity mgr., Ford Instrument Co., div. of Sperry Rand Corp.	Asst. to dir. of public relations
Frank F. Kates	Dir., R&D, Advance Industries	With Hughes Aircraft Co.
Harold E. Francis	Asst. chief engnr., accessories, controls, fuels and lubricants, Wright Aeronautical Div.	Staff engnr.
Dr. James A. Marsh	VP, Systems Laboratories Corp.	Radar Group Leader, autonetics engrg. dept., North American
Arthur C. Cocagne	VP-field engrg., Telecomputing Corp.	Dir. field engrg., Whittaker Gyro
Wayne K. Galloway	Mgr. pressure suits and Avtrim sales, B. F. Goodrich Aviation Products	Field sales engnr.
Dr. Thomas H. Pigford	Chmn., dept. of reactor engrg., general atomic div., General Dynamics Corp.	Associate professor, MIT
John A. McCabe	Gen. mfg. mgr., aircraft engine div., Ford Motor Co...	Gen. production mgr.
Herman J. Pelkey	Plant mgr., Kellett Aircraft Corp.	Factory mgr.
Elmer A. Beck, Jr.	Exec. engnr., Cook Research Laboratories	Mechanical research and devel. engnr.
J. F. Weiffenbach	Dir., research and engnr., Borg-Warner Corp.	Research engnr.
M. W. Tuttle	VP and gen. mgr., Radioplane Co.	VP-operations
Maurice R. Eastin	Gen. sales mgr., Brush Electronics Co.	Asst. gen. mgr., perfex div., General Controls Co.
L. E. Dalton	VP-mfg., Kelsey-Hayes Co.	Mfg. mgr.
A. I. Fenwick	Public relations mgr., Aero Engine Div., Rolls-Royce Limited	Deputy pub. rel. mgr.
John H. Carter	Mgr., weapon system organization, Lockheed's Missile Systems div., Palo Alto, Calif.	Associate research dir.
Stanley W. Burriss	Mgr. weapon system organization, Lockheed's Missile Systems div., Sunnyvale, Calif.	Engineer in chg. flight test activities

AIRLINE

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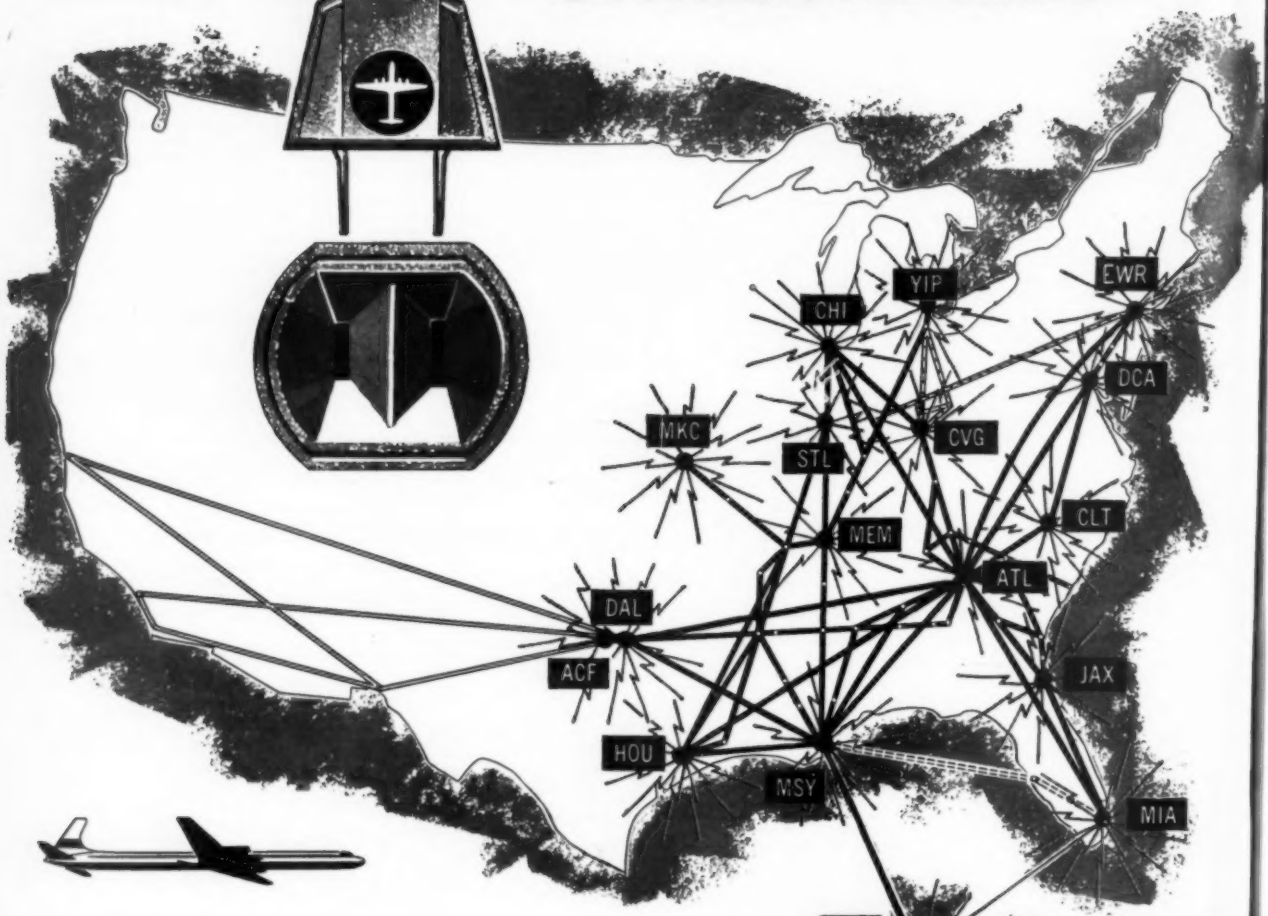
W. L. Scott	Gen. mgr., North American Div., Cubana Airlines ..	Spec. rep. Caribbean Div.
Richard G. Dinning	VP, Allegheny Airlines	Asst. to the president
M. P. Bickley	Sales mgr., eastern div., United Air Lines	Eastern regional sales mgr.
Alastair Thomson	VP-commercial services, Seaboard & Western Airlines	Commercial mgr.
John H. Mahoney	Asst. to president, Seaboard & Western	Dir. traffic planning, American Airlines
John R. Rosenwald	VP-administration, Seaboard & Western	Asst. to secy. and asst. treas.
Thomas Trone	Mgr. military transp., Trans World Airlines	Sales rep., Washington, D. C.
Gerald Charles Donley	Dir. purchasing, Northeast Airlines	Supv. of stores, treas. dept.
Paul V. McPeake	Mgr. customer service dept., Northeast Airlines	Dir. of stations
Robert S. Angstadt	VP-oper., Chicago Helicopter Airways	Operations mgr.
J. C. Crawford	Dir. research and devel., Trans-Texas Airways	Mgr. rates and tariffs
George J. Barbier	Mgr. rates and tariffs, Trans-Texas Airways	Asst. office mgr.
J. K. Courtenay	Dir. research, Southern Airways	Revenue auditor
Thelma Doyle	Chief stewardess, Central Airlines	With American Airlines
John P. Barrett	Dir. traffic and sales, Riddle Airlines	Gen. traffic mgr.
Donald F. Hoirup	Asst. to president, United States Overseas Airlines ..	Washington rep., Trans American Airlines
Vernon Radcliff	Director economic research, TWA	Associate director, CAB bureau of air operations
Frank (Kelly) Achilles	Asst. chief engnr., Braniff Airways	Sr. field service engnr., AiResearch Mfg. Co.
J. F. Forster	Exec. vp, Vickers, Inc.	VP and asst. gen. mgr.
Edmund C. Sulsman	Gen. sales mgr. aviation and ordnance, Weatherhead Co.	vp-sales Jack & Heints
Norman P. Trost	Pres. Narmco Mfg. Co.	GM Aeroproducts exec.

Delta makes connections with 54 Trunk, Local Service and Overseas Air Lines



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TRANSPORT TRENDS

Washington, D. C., Feb. 25, 1957

BIG JUMP IN CAA ESTIMATES of future air traffic is interesting commentary on industry growth. Less than two years ago, CAA estimated that U.S. domestic air passengers in 1960 would total 55 million. Its revised estimate (see page 31) is 66 million. For 1965, old forecast was 70 million; new one is 93 million. (These are "intermediate" estimates. CAA gives three: low, intermediate and high.)

U.S. international and overseas passenger estimate was upped from 5 million to 6.2 million for 1960, and from 6 million to 8.9 million for 1965.

Air cargo forecast was also changed—from 500 million to 600 million ton-miles in 1960; from 800 million to 1 billion in 1965.

•

THINKING INSIDE CAB is definitely anti-fare increase and anti-subsidy for domestic trunks now operating on a subsidy-free basis. Board still stands on its 1953 statement that short-term gains or losses will be no grounds for revenue adjustments. Its policy will be based on the average of earnings over an extended period of years.

•

CAB'S ORIGINAL PLAN for a one-year streamlined procedure for its General Passenger Fare Investigation has vanished. So controversial are policy issues being fought out by government and industry lawyers that case will be well over a year old before hearings start.

•

DC-3 REPLACEMENT PROJECT continues to gain momentum at Douglas (AMERICAN AVIATION, Jan. 28). Company has shown its proposal to CAB and to Commerce Undersecretary for Transportation Louis B. Rothschild. It's now preparing a brochure for Pentagon clearance. Security classification of Lycoming T55 engine has been a hitch until now. However, the turboprop is expected to be declassified soon.

•

FORCEFUL PILOT ACTION plus publicity have erased a year-long airspace controversy in one week. Pilots flying up and down east coast have insisted that overwater cut-off route from Wilmington, N. C., to West Palm Beach be widened from 30 to 50 miles. For a year, Navy has blocked action in Air Coordinating Committee airspace subcommittee.

Pilots of three airlines—Eastern, National and Northeast—refused to fly the cut-off, starting Feb. 10, and stuck to longer coastal route. Unfavorable publicity, plus 20- to 30-minute penalty on some 150 daily New York-Miami flights, forced action. On Feb. 17, Navy found a way to revise its activities in the area to permit safe operation by airlines via a wider overwater corridor.

•

FIRST BIG 1957 SESSIONS for CAB with Congress will come next month. March 1 and March 15 are tentative dates for closed hearings, the first on a supplemental appropriation for fiscal 1957, the second on CAB's fiscal 1958 budget. Paramount in the sessions will be CAB auditing activities and consideration of the biggest operating budget—and biggest single-year increase—ever sought by the agency.

HOW TO GROUND-HANDLE JET TRANSPORTS

Inwood Says: Move Them on Rails at Airports

Philadelphia's aviation chief suggests a system of flatcars on railroad tracks to avoid dangers of taxiing aircraft to loading ramps.

A proposal for handling jet transports at airports by moving them to and from gate positions on oversized "flatcars" operated on railroad tracks has been advanced by Louis Inwood, Philadelphia's Deputy Director of Commerce for Aviation.

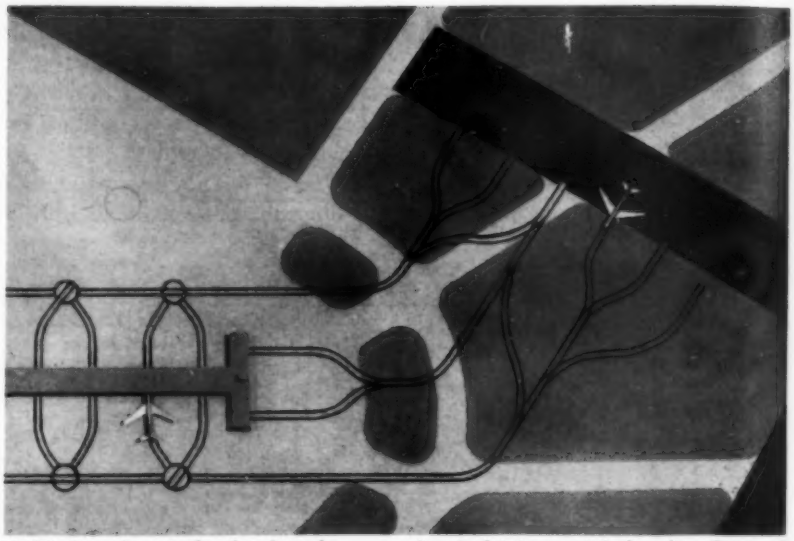
He also has a plan for enlarging airport terminal space by adding "modules" (specially designed buildings) to present facilities.

Currently, both airlines and airport operators are for the most part undecided on the proper method of ground handling of jets. Some believe the aircraft can be taxied to and from gates; others lean toward the idea that they must be towed. Inwood's proposal is designed to try to bring some of the thinking and planning to a head.

• **"This plan** is provocative," he said. "We don't claim to have a patent on the answer, and maybe someone will have a better idea. But we want to get something started. We don't think it's practical, safe or economical to taxi jets near terminals, but if somebody proves we're wrong we'll admit it."

He quoted the U.S. Air Force as stating that if big jets are taxied into terminal areas, a space of 245 feet is needed from the center of one gate position to the center of the adjacent one, to allow sufficient space to maneuver into position for parking.

Also, on noise, an "area of pain" extends 1,100 feet back from the pods of four J57 engines. Blast velocity is 140 knots 100 feet back of the pods, 90 knots at 200 feet, and 40 knots at 500 feet.



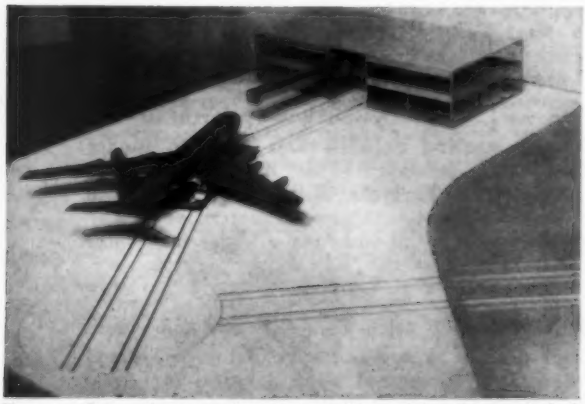
Model shows layout of railroad tracks on an airport. Jet transport is boarding flatcar at upper right. Another can be seen at terminal on left.

Inwood believes these statistics support a position that taxiing is not feasible. He has, therefore, proposed the flatcar idea.

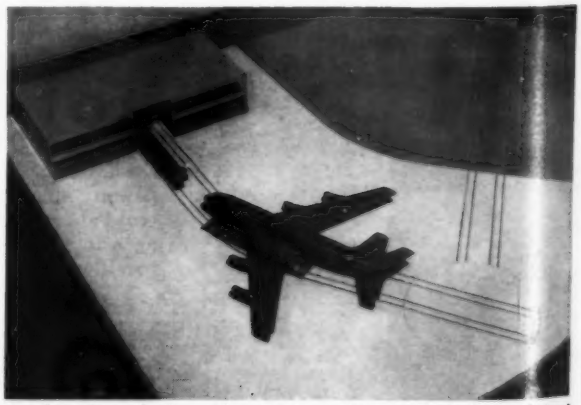
Under this arrangement, standard gauge railroad tracks would extend from each gate to some point out on the field (distance undetermined). At the field end, the tracks would be depressed 4 feet 6 inches into the ground, so that the flatcar would be at ground level.

A jet transport could, therefore, be taxied onto the flatcar, or "platform," which is 65 feet long and 33 feet wide. Each car would have four main trucks—16 heavy railroad wheels, running on two sets of tracks.

There would be guidance channels for nose wheel and main gear, and built-in chocks would position the plane correctly on the platform (chocks would be located at different positions for different types of planes, and would be set by the platform operator). The chocks would assure that the aircraft was in proper position for entry into the terminal.



Plane on flatcar has passed over turntable and has been switched to the correct gate. Adjustable cantilever passageway for loading and unloading can be seen extending from terminal.



Another view of plane about to nose into terminal. Note that at outer position tracks are depressed into the ground so that flatcar is at ground level and jet can taxi aboard.

• **It's proposed** that the platform be diesel-powered—using four gallons of fuel per hour as compared with 75 gallons per minute required to taxi a jet. In addition, it will have power for engine starting, air-conditioning and other purposes.

Two conveyor belts, each 30 inches wide, will extend the full length of the car, in the area between the plane's nose wheel and main gear. Thus, as soon as the aircraft was positioned on the car, baggage could be unloaded and placed on the belt.

Moving toward the terminal, the car would roll onto an electrically-operated turntable, which would guide it to the correct gate. At the terminal, the nose of the plane enters the building.

An adjustable cantilever passageway extends from the terminal along the side of the plane, with doors for both front and rear door unloading and loading. The car's conveyor belts are started and transfer the baggage to other belts in the terminal which run to the baggage-claiming area.

Inwood thinks it is feasible, in such an operation, to refuel at the terminal, from pits under each wing. With the plane nosed into the terminal, it is possible to have fire protection equipment attached to the building to handle any emergency, he said. In addition, the flatcar would have similar equipment.

On departure, the car would back out of the building until it reached the turntable, where it would be switched so that the plane's nose faced toward the field. Engines would be started at the off-loading position, at which point retractable blast fences would be raised.

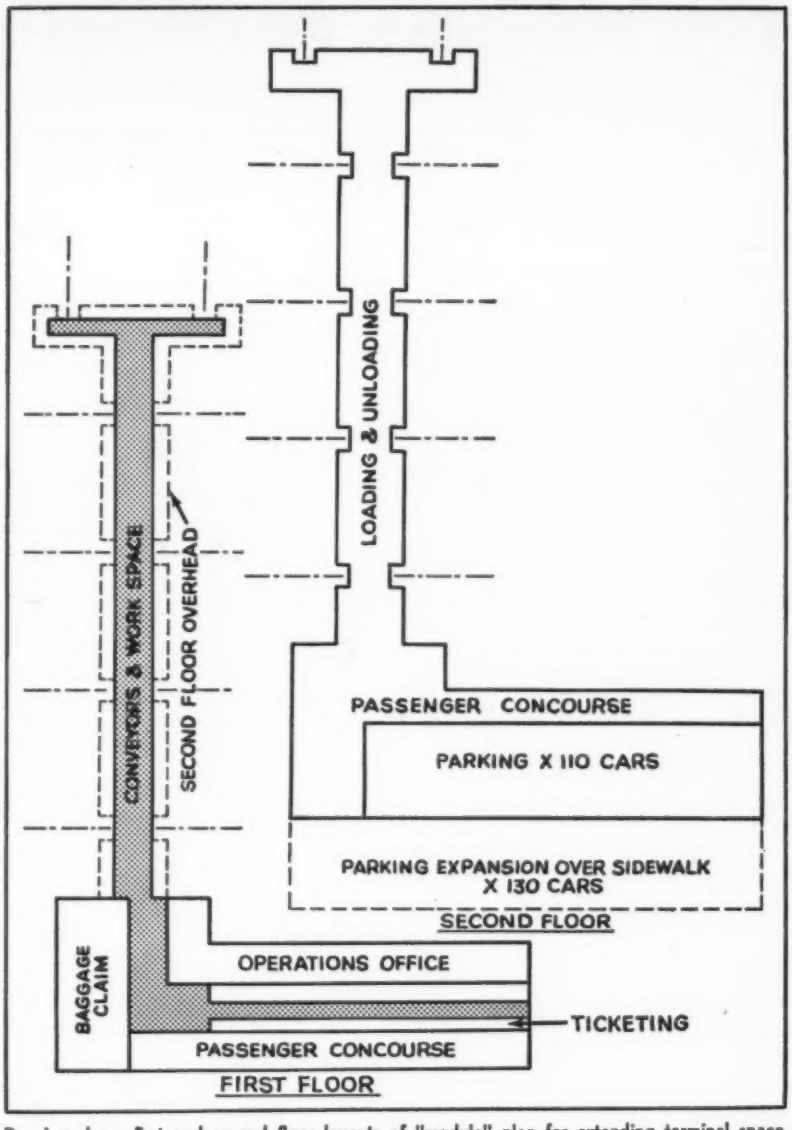
• **The cost** of such a trackage system is as yet undetermined. Inwood said the cost of one flatcar is roughly estimated at $100,000. But he pointed out that other savings would help defray the cost of cars and track. For example, inasmuch as heavy jets would not be taxied into the terminal, only the taxiways out on the field and the area under the tracks would have to be of thick concrete. Other areas could be covered with thinner paving. With concrete at $23 per cubic yard installed, the savings would be substantial.

Advantages claimed for the "Philadelphia system" include:

• Blast and noise is kept away from the terminal area.

• Operations economies—the need for much ramp equipment—loading stairs, baggage carts, etc.—is eliminated.

• Gate positions can be only 150 feet center-to-center, compared with the USAF figure of 245 feet. This is even less than the present 170 feet required to handle large piston-engine aircraft. For example, with Philadelphia's present "fingers," it is possible to park nine planes. Using the 245-ft. figure, this would be reduced to five. But with tracks, nine jet positions could be maintained.



Drawing shows first and second floor layouts of "module" plan for extending terminal space. Extreme right side of module would join onto terminal building. Another module could be added to this one at area marked "baggage claim."

• As pointed out above, economy in apron construction would be possible. Inwood estimated 2.5 acres of apron per gate position—all heavy concrete. Most of this would be eliminated.

• Passenger and baggage loading and unloading would be speeded.

Inwood's idea of extending terminal space as needed is to add "modules." A module consists of a building extending from the terminal and, at right angles to it, a finger containing 10 gate positions. Another module could be added to the first, a third one to the second, etc.

In the terminal extension area of the module, the first floor would contain ticketing and baggage claim facilities, operations offices and conveyor belts extending out the finger to gates. After checking in, passengers would ascend by escalator to the second floor and walk to the gates. This floor also contains parking facilities for 110 cars.

The third floor and roof will each handle 200 cars. This parking area would be primarily for passengers desiring to leave their cars while on trips.

• **With this arrangement,** passengers would not be required to go through the main terminal. They would proceed directly to the module for check-in and can depart from it after claiming baggage.

Inwood said a rough estimate of the cost of the module would be $1.6 million for the terminal extension area, plus $1 million for the finger.

He pointed out that the first jet transports are scheduled to be in service in 1959. "It's going to take us two years—at forced draft—to get ready for the jets," he said. "That means we should get started this year."

Twin Headache: No-Shows and Oversales

United Air Lines stops overbooking, adopts 'positive check-in' procedure; other airlines have different approaches to latecomers.

By ERIC BRAMLEY

"During its peak season, an airline prays for no-shows so it can accommodate its oversales. In the lean season, it prays for oversales to fill the seats of the no-shows."

So says an airline traffic expert in commenting on two major airline reservations problems—no-shows and oversales. All the carriers are now in the process of trying to reach agreement on a plan to solve their no-show problem.

And at least one airline is tackling the question of what to do about flights that become "oversold."

United Air Lines, considering this problem to be both serious and embarrassing, has revised its check-in procedures and has made other important changes.

'Overbooking' Ended

For one thing, it has stopped "overbooking"—taking more reservations for a flight than there are seats, on the premise that late cancelations and no-shows will open up enough space for the excess. Incidentally, this practice—which had been carried on by some carriers (sometimes at the local level, without knowledge of management)—is now frowned on by the Civil Aeronautics Board.

UAL president W. A. Patterson told AMERICAN AVIATION that the company "discontinued the practice of deliberate overbooking" several weeks ago. "We have a certain percentage of oversales due to clerical errors and to deliberately oversell over and above those errors just compounded the problem," he said.

• **UAL is also using** a procedure called "positive check-in" to prevent oversales from actually boarding airplanes. Under the former system, when a passenger bought a ticket at a city office, he was issued a gate pass. When he reached the field, it was not necessary for him to go to the counter unless he wished to check baggage (UAL collects tickets aboard the airplane).

If he did check baggage, the agent merely glanced at the ticket to see that it was made out for the correct trip. Thus, if there were oversales due to clerical errors or overbookings, it was possible for these oversales to get aboard the plane.

"Sometimes we found ourselves with more people than seats," Patterson told UAL employes recently. "At that point it was necessary to carry on a public and embarrassing negotiation to try to persuade the overflow to leave the airplane and speculate on a later trip or another airline. In addition, we were making public financial bids to persuade people to leave the airplane.

"I am of the opinion that we should never permit the 'mistakes' to get into the airplane. They should be checked before boarding and adjustments should be made quietly and privately. We should not expose our employes or our passengers to a public auction.

"When we make these mistakes, there is just one thing to do—to honestly state that a mistake was made. Under no circumstances should we try to cover up. On an average, we make from four to five mistakes per 1,000 passengers carried. As I see it, that's about all we can expect in quality control from the present reservations system."

How Positive Check-in Works

UAL's positive check-in system, designed to make it impossible for the "mistakes" to board the airplane, works as follows: Gate passes are now issued only at airport ticket counters. This forces a passenger to contact the counter. When he does, the agent calls "load planning"—a desk that has charts for all flights—and checks the information on the ticket. This is done either on an open phone line or by intercom. If the information checks, the passenger is cleared. But if there is no record of the customer, he is so informed and arrangements are made for alternate transportation, or adjustments are made.

"We do try to make financial adjustments at the time such mistakes occur," Patterson explains. "This is to avoid later litigation or ill will that may arise as a result of such an incident. At one time these adjustments ran to rather substantial figures; however, with improvement in the reservations system and closer checks on errors, these financial adjustments now are rather insignificant."

• **What do other carriers** do about oversales? Some of them, including major ones, use a different system from United's, and say it's working well. Under this procedure, a passenger need not check at the airport counter unless he has baggage. Tickets are lifted at the gate.

If a 60-passenger airplane is being used, the first 60 people through the gate get the seats. The remainder are oversales, regardless of when they purchased their tickets. "A ticket bought 10 minutes ago at the airport counter is just as valid as one bought two weeks ago," said a passenger service

UAL Overhauls 1,000th DC-6

Milestone in maintenance was reached by United Air Lines recently when the 1,000th Douglas DC-6 periodic overhaul was completed at carrier's San Francisco base. Since introduction in May 1947, United has expended some 5,000,000 manhours overhauling Douglas DC-6, DC-6B and DC-7 transports.

representative of one carrier. The oversales are offered alternate transportation, but this representative claimed that he had never heard of his company overbooking or making financial adjustments.

Another airline using a similar system said that anyone caught deliberately overbooking is subject to immediate dismissal. It also denies that it makes cash payoffs. However, in some instances it may pay cab fares, meals and other expenses of oversales. In this case, the oversale signs a "passenger inconvenience settlement" form.

Those airlines that regard the last arrivals for a flight as the oversales do so in spite of an interline rule that says such situations should be handled differently.

The Air Traffic Conference's "standard interline reservations procedures" says that if space "is not available on a desired flight to accommodate all confirmed passengers, normally refuse or remove the last passenger(s) booked and if that cannot be determined, refuse or remove passenger(s) who will be least inconvenienced and in the following order: (1) on-line locally boarding passenger, (2) interline connecting passenger, (3) through passenger."

• **One observer** who follows sales developments closely said that while he doesn't necessarily endorse overbooking, he believes any carrier can make a good case for following such a policy.

"Suppose the airline knows, from records of the past few years, that an average of five people will be 'late cancelations' on a certain flight," he said. "This doesn't include those who no-show — just late cancelations. Chances are you could overbook the flight by five a day and be sure that these passengers would get aboard.

"Let's assume that during a month you have eight oversales on this flight. Maybe five of them accept alternate space without any trouble. A financial adjustment may have to be made with the other three. You've inconvenienced eight people, and that isn't good. But at the same time you've been able to furnish transportation for almost 150 others that you otherwise would have refused and who might have turned to other forms of transportation.

"Extend this statewide and you've accommodated thousands of people. And at the same time you've increased your annual revenue by hundreds of thousands of dollars."

CAB Frowns on Practices

The CAB, however, frowns on overbooking and financial adjustments. Last summer it warned the industry to stop "deliberate overbooking of flights to offset the expected number of no-shows" and to stop granting "free transportation or cash payments to oversold passengers."

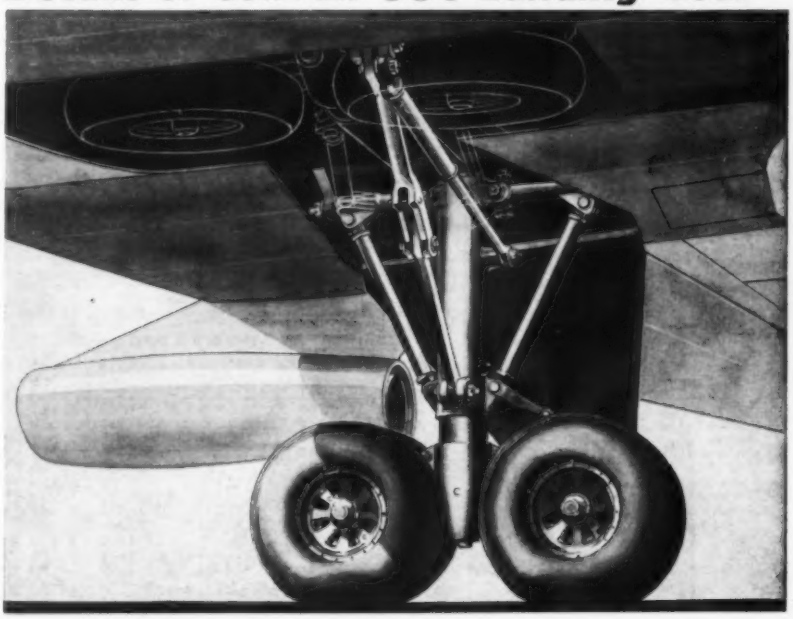
• **Patterson told** AMERICAN AVIATION that "the reservations system is one of the most complicated problems facing the airline industry. Without question there is a problem involving the 'no show' and much publicity has been given to blaming the passenger for our problems. However, the truth of the matter is that 80% of all problems are the result of clerical errors; 20% of our problems can be charged to the 'no show.' We have a job to do in getting our own house in order before we can demand perfection from the customer.

"The CAB has been critical of the reservations system and I understand has threatened to take action to correct it. I welcome such correction."

Discussing the reservations problem in UAL's company publication, Patterson said, "We are working with leading electronics engineers to help solve it. The 'task force' we have working with this group of outsiders is extremely optimistic that we will have a good answer to the problem operating and functioning by 1962.

"This is a long way off. My only hope is that we don't have to wait until 1962 for all the answers because I doubt if the public is going to have the patience to put up with the situation that long." ◈◈◈

Details of Convair 880 Landing Gear



Main landing gear of the Convair 880 jet transport is designed for free fall into down-and-locked landing position without hydraulic power, and will be stressed for use as a drag brake for reducing speed.

The main four-wheel gear may be lowered independently of the two-wheeled nose gear at indicated speeds up to 375 knots (Mach .89). The nose gear may be lowered at indicated speeds up to 320 knots (Mach .83). A total of 10 wheels will support the Convair 880 on the ground.

Structural members of the main gear will be built around a straight forward shock strut with articulated, tandem wheel pairs. Main shock struts will be interchangeable right or left side, according to Jack Hudson, Convair 880 landing gear design specialist.

• **Main gear tires** will be 20-ply rating nylon, 12.50-16, with maximum pressures of 115 lbs. per square inch. Co-rotating, oil-bath bearing, nose gear wheels will be 7.50-14, 12-ply rating nylon with an approximate maximum pressure of 80 lbs. per sq. in.

Tire deflection on landing will be 28%, with maximum deflection of 37½% on takeoff, insuring long tire life. The main gear will bring the Convair 880 to a safe stop with two flat tires on either side, if the need arises, Hudson declared.

The Convair 880 will be equipped with nose and main gear disc-type brakes, with air scoops for cooling. The nose gear will have provisions for automatic brake shutoff when the nose wheel is turned beyond 5 degrees to aid in taxi controllability. An anti-skid device will be standard equipment, and it is to be located inside an oversized axle, permitting removal of wheels without disturbing the anti-skid device.

An additional safety feature of the braking system will be lock-out cylinders between the pressure source and the brake actuating device, designed to shut off the flow of hydraulic fluid in case of seal failure or other accidental leakage. In case of complete hydraulic system failure, a separate "back-up" high pressure air system will insure safe stops.

• The Convair 880 will maneuver under its own power in an 85-foot radius circle by means of a power-steering nose wheel which may be turned through an arc of 140 degrees.

Resignation of Six Carriers Hits Conference of Local Airlines Hard

The status of the Conference of Local Airlines appeared uncertain as the result of joint resignation from the Conference of six of its 13 local service airline members.

Resigning carriers were Central Airlines, Bonanza Airlines, Frontier Airlines, Ozark Airlines, Lake Central Airlines and West Coast Airlines. Their joint letter of resignation was received on the morning of February 11, by Conference chairman John F. Floberg, who maintains the organization's headquarters at his Washington law offices.

Decision to resign was taken at Phoenix, Ariz., where heads of the six carriers met on February 7 and 8. Also in attendance, but not signing the resignation letter was Southwest Airways' president John H. Connelly.

But Connelly did join the others in a joint letter sent simultaneously to CAB Chairman James R. Durfee in which the dissident group endorsed a CAB suggestion for government guaranteed loans to assist the locals in their re-equipment program.

• **The Conference** was originally set up in 1953 under the direction of ex-CAB Chairman Donald W. Nyrop, who since has assumed the presidency of Northwest Airlines. Its purpose was to represent the specialized interests of the local airlines not otherwise covered by their membership in the Air Transport Association.

In November, 1954, Floberg was named to fill the spot vacated by Nyrop's move to Northwest. The Conference generally is credited with leading the locals' fight for permanent certificates which saw the passage in 1955 of legislation guaranteeing such permanency.

In the past two years, however, there has been a widening division between a group of local carriers, including the six which resigned, and an Eastern group which includes Allegheny Airlines, Mohawk Airlines and Piedmont Aviation.

The split developed over procedure and policies to be followed by the Conference in coping with financing for the needed re-equipment program and eventual termination of subsidies.

The government-guaranteed loan issue appeared to be the point in this over-all dispute on which the decision of the six to resign turned. Last December, CAB instituted an investigation to consider charges of the local

Summary of Airline Traffic for Calendar 1956 & 1955

Compiled by American Aviation Publications from Official C.A.B. Data.

Airlines	Revenue Passengers			Revenue Passenger Miles (In Thousands)			Total Ton-Miles Rev. Traffic			% Available Ton-Miles Used	
	1956	1955	% Change	1956	1955	% Change	1956	1955	% Change	1956	1955
DOMESTIC											
American	7,706,681	7,238,615	6.5	4,800,526	4,268,314	12.5	567,416,652	508,876,487	11.5	60.47	60.66
Braniff	1,788,172	1,638,786	9.1	721,617	608,699	18.6	77,386,438	64,929,088	19.2	53.16	55.33
Capital	2,984,410	2,570,170	16.1	1,021,564	803,923	15.6	106,817,136	86,927,252	22.9	94.90	44.45
Caribair	177,795	142,332	24.9	12,774	11,042	15.7	1,202,492	1,043,773	15.2	56.57	50.46
Continental	707,938	602,466	17.5	259,595	222,253	16.8	27,331,309	23,628,976	15.7	46.20	45.86
Delta	2,371,183	2,101,351	12.8	1,127,109	955,847	18.9	122,679,183	104,352,725	17.6	55.59	58.74
Eastern	7,422,612	6,558,198	13.2	3,790,759	3,344,448	13.3	420,903,794	373,054,798	12.8	48.10	49.99
Hawaiian	417,980	417,457	0.1	57,838	57,255	1.0	6,405,692	6,669,755	—4.0	54.80	54.87
National	1,358,000	1,205,712	12.6	949,171	852,597	11.3	105,954,298	94,969,531	11.6	65.16	62.69
Northeast	593,449	583,151	1.8	119,454	116,728	2.3	11,576,066	11,346,893	2.0	56.03	57.40
Northwest	1,319,933	1,246,258	5.9	872,379	823,798	5.9	101,370,777	95,154,636	6.5	53.84	54.15
Trans-Pac.	206,624	199,348	3.6	26,032	25,469	2.2	2,146,733	2,092,393	2.6	52.70	52.44
TWA	4,154,742	3,805,253	9.2	3,266,510	2,874,995	13.6	358,161,337	321,067,005	11.6	58.78	59.81
United	6,185,299	5,503,424	12.4	4,274,422	3,771,686	13.3	500,412,290	439,711,766	13.8	59.07	58.69
Western	928,746	1,092,578	—15.0	458,131	514,677	—11.0	48,480,929	54,999,082	—11.9	56.25	54.99
TOTALS	38,323,564	34,895,009	9.8	21,757,881	19,251,731	13.0	2,458,245,126	2,188,824,210	12.3	55.82	56.43
INTERNATIONAL											
American	138,586	130,594	6.1	99,103	91,985	7.7	13,890,810	12,241,286	13.5	67.12	69.54
Braniff	32,501	34,862	—6.8	69,669	75,580	—7.8	9,052,897	9,905,783	—8.6	51.69	43.63
Delta	58,086	49,857	16.5	64,837	55,615	16.5	7,340,884	6,568,329	11.8	48.47	42.13
Eastern	250,799	182,309	37.6	338,101	253,596	33.3	38,010,067	28,894,892	31.5	57.47	58.74
National	108,457	104,891	3.4	62,216	55,571	12.0	6,911,916	6,344,120	8.9	54.89	47.19
Northwest	114,758	98,112	17.0	230,751	195,508	18.0	47,057,706	38,574,478	22.0	70.18	64.58
Hawaii	13,474	.....	....	33,653	.....	....	3,968,211	.....	....	62.37	....
Panagra	143,222	137,591	4.1	172,103	164,329	4.7	23,228,317	20,910,123	11.1	59.52	56.18
Pan American											
Lat. Am.	1,216,739	1,045,131	16.4	1,136,021	963,065	18.0	153,794,923	130,532,628	17.8	61.99	61.46
Atlantic	996,611	846,923	17.9	1,272,710	1,069,126	19.0	169,854,069	143,058,204	18.7	61.93	64.13
Pacific (Seattle/ Portland-Honolulu)	298,800	232,782	28.4	886,276	687,571	28.9	122,144,822	99,904,487	22.3	69.29	69.06
Alaska	NA	.....	....	NA	.....	....	NA	.....	....	NA	....
TWA	77,700	77,220	0.6	90,974	98,231	—7.4	13,889,856	14,572,590	—4.7	54.46	51.82
United	273,398	242,331	12.8	710,895	627,936	13.2	93,618,524	83,953,547	11.5	69.45	70.86
	98,410	86,105	14.3	244,527	214,742	13.9	27,143,793	24,019,264	13.0	64.65	71.05
TOTALS	3,810,067	3,268,708	16.6	5,378,183	4,552,855	18.1	725,938,584	619,479,731	17.2	63.73	63.47
LOCAL SERVICE											
Allegheny	393,668	349,673	12.6	64,942	55,983	16.0	6,569,553	5,623,672	16.8	45.21	46.85
Bonanza	132,204	107,115	23.4	28,919	23,675	22.1	2,910,702	2,374,941	22.6	42.53	42.40
Central	107,758	94,282	14.3	19,760	15,518	27.3	2,033,980	1,610,648	26.3	30.42	25.33
Frontier	197,902	176,922	11.9	53,300	46,290	15.1	6,431,653	5,342,820	20.4	62.74	54.93
Lake Central	136,956	114,148	20.0	21,368	16,995	25.7	2,130,759	1,724,745	23.5	37.69	32.63
Mohawk	360,486	283,397	....	71,173	50,954	....	NA	5,068,770	....	NA	54.58
N. Central	551,775	431,324	28.0	85,659	67,667	26.6	8,775,078	6,950,699	26.2	46.41	45.24
Ozark	318,994	247,031	29.1	49,013	36,617	30.3	4,980,197	3,759,628	32.5	38.66	37.08
Piedmont	405,153	362,233	11.8	77,136	70,043	10.1	7,854,801	7,121,317	10.3	52.80	51.59
Southern	191,080	170,589	12.0	33,752	28,845	17.0	3,488,081	2,990,380	16.6	42.82	39.82
Southwest	289,240	268,618	7.7	59,398	52,345	13.5	5,909,876	5,255,865	12.4	48.34	55.46
Tran-Texas	220,613	157,659	40.0	50,184	35,975	37.5	5,293,370	3,811,564	38.9	36.41	36.26
West Coast	214,874	200,945	6.9	38,134	35,110	8.6	3,626,285	3,353,369	8.1	50.04	48.73
TOTALS	3,520,523	2,963,936	18.8	652,738	537,017	21.5	60,004,335	54,988,418	....	45.15	45.08
HELICOPTER SERVICE											
CHI Helicopter	876	.....	....	14,000	.....	....	30,246	28,458	6.3	37.30	41.99
Los Angeles	20,419	5,183	293.9	779	156	399.4	140,756	84,598	66.4	48.58	40.01
N. Y. Airways	43,205	24,569	75.9	815	492	65.7	109,757	80,616	36.1	52.21	51.45

NA—Not available.

industry that Board policies had resulted in a profitless expansion of the local carriers.

Simultaneously, Durfee, on behalf of the Board, wrote Floberg that CAB would "look with favor on the development of a program of equipment loans guaranteed by the Federal Government to assist the local service airlines in financing needed modern aircraft under appropriate circumstances."

The Conference, as such, has taken no position on the CAB idea. But, as stated, the six resigning carriers plus Southwest have now endorsed CAB's proposal.

Meanwhile, the resignation action came just one week before a major meeting scheduled by the Conference's directors for Chicago on February 18. Purpose of that meeting was to consider plans to expand the Conference's Washington headquarters and possibly to appoint an assistant to Floberg.

• **Floberg polled** the directors to see if, despite the resignation notice, the Chicago meeting would be held. If not, it appeared a full Conference meeting would be called for late this month.

Spokesmen for carriers remaining in the Conference were not optimistic over the organization's chances of continuing if the resignations of the six carriers are adhered to. Under the Conference by-laws, members are expected to give six months' notice of resignation intentions.

Whether or not the six resigning members are, or feel they are, bound by the notice provision could not be determined.

Three possibilities are apparent at this time. Either the Conference will ride out the storm and continue with Floberg at the head, or it will continue with a new leader, or a new organization will be developed by the six resigning carriers.

CAB Reorganizes Safety Staff Setup

Civil Aeronautics Board has wound up its top-level staff reorganization program with the naming of four aides to newly appointed Safety Bureau director Oscar Bakke.

The Board also announced the retirement of W. K. Andrews, head of the Bureau of Safety Investigation for the past nine years.

Under the new setup Leon S. Tanguay will head up investigation activities as acting associate director (investigation) in the Bureau of Safety.

John Chamberlain becomes acting associate director (regulation); Robert L. Froman, asst. director (inter-departmental affairs) and, John F. Pahl, acting chief, technical division, Bureau of Safety.

Summary of Airline Traffic for December 1956 & 1955

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Airlines	Revenue Passengers			Revenue Passenger Miles (In Thousands)			Total Ton-Miles Traffic		Rev.	% Available Ton-Miles Used	
	1956	1955	% Change	1956	1955	% Change	1956	1955	% Change	1956	1955
DOMESTIC											
American	564,261	563,659	0.1	371,972	341,863	8.8	47,187,811	43,329,898	8.9	61.27	62.52
Braniff	142,245	129,627	9.7	61,585	49,246	25.1	6,740,805	5,406,515	24.7	46.57	52.57
Capital	229,311	195,768	17.1	85,233	63,669	33.9	8,918,759	7,007,233	27.3	45.53	45.08
Caribair	17,072	12,816	33.2	1,215	984	23.5	115,887	95,756	21.0	53.72	50.19
Continental	58,179	51,891	12.1	21,707	18,991	14.3	2,318,938	2,082,968	11.3	45.74	45.09
Delta	195,551	165,752	18.0	98,928	76,890	28.7	10,920,736	8,675,161	25.9	51.19	57.31
Eastern	621,550	563,586	10.3	338,999	309,970	9.4	38,513,263	35,374,784	8.9	43.86	47.28
Hawaiian	33,172	31,941	3.9	4,479	4,239	5.7	508,912	520,701	—2.3	55.75	53.58
National	118,639	106,212	11.7	83,440	77,623	7.4	9,491,242	8,949,036	6.1	54.92	60.12
Northeast	36,371	39,603	—8.2	7,772	8,032	—3.2	769,854	801,346	—3.9	48.37	55.88
Northwest	92,264	89,479	3.1	62,348	61,244	1.8	7,794,121	7,745,984	0.6	51.63	54.44
Trans-Pac.	14,877	14,152	5.1	1,781	1,760	1.2	157,348	148,110	6.2	58.72	48.98
TWA	329,487	306,398	7.5	278,187	244,446	13.8	31,339,857	28,390,106	10.4	57.03	59.41
United	435,873	404,291	7.8	309,957	280,163	10.6	38,677,950	33,872,994	14.2	55.77	55.68
Western	96,408	84,011	14.8	48,528	41,651	16.5	5,285,437	4,626,412	14.2	55.75	55.52
TOTALS	2,985,260	2,759,186	8.2	1,776,131	1,580,771	12.4	208,740,920	187,027,004	11.6	52.92	55.22
INTERNATIONAL											
American	11,099	9,675	14.7	7,961	6,770	17.6	1,170,240	975,838	19.9	61.93	64.82
Braniff	2,992	2,723	9.8	6,439	5,897	9.2	838,203	809,593	3.5	58.71	39.61
Delta	4,837	4,691	3.1	5,622	5,282	6.4	637,785	626,731	1.8	49.53	46.14
Eastern	21,776	16,432	32.5	28,811	22,665	27.1	3,308,051	2,696,154	22.7	55.47	56.47
National	8,777	9,632	—8.9	5,363	5,563	—3.6	604,723	640,306	—5.6	53.07	61.39
Northwest	8,453	8,795	—3.9	16,825	16,161	4.1	4,120,868	4,034,829	2.1	71.91	75.25
Hawaii	1,149	.....	....	2,996	.....	....	375,451	.....	....	65.58	....
Panagra	11,998	11,437	4.9	15,961	13,277	20.2	2,292,637	1,790,805	28.0	65.76	54.56
Pan American											
Lat. Am.	106,672	97,956	8.9	105,931	87,055	21.7	14,976,906	12,507,062	19.7	62.92	58.95
Atlantic	63,845	59,632	7.1	94,346	75,872	24.3	14,210,152	11,960,789	18.8	65.61	65.92
Pacific (Seattle/Portland-Honolulu)	25,309	18,646	35.7	78,088	54,725	42.7	11,510,559	8,531,365	34.9	69.04	66.21
	NA	.....	....	NA	.....	....	NA	.....	....	NA	....
Alaska	4,825	5,323	9.4	5,498	9,464	—41.9	883,112	1,298,207	—31.9	50.95	56.50
TWA	16,235	14,033	15.7	42,987	36,577	15.7	6,751,479	6,190,717	9.1	72.18	67.65
United	6,013	5,576	7.8	14,921	14,592	2.3	1,818,797	1,720,698	5.7	52.96	73.54
TOTALS	292,831	264,551	10.7	428,753	353,900	21.2	63,123,512	53,783,094	17.4	64.69	62.97
LOCAL SERVICE											
Allegheny	24,841	24,410	1.8	4,197	4,025	4.2	443,522	424,454	4.5	40.13	43.40
Bonanza	10,354	8,564	20.9	2,296	1,876	22.4	234,127	192,690	21.5	42.23	35.15
Central	7,292	1,487	—2.4	1,543	1,290	19.6	164,241	136,812	20.0	26.57	28.59
Frontier	15,540	12,504	24.3	4,550	3,509	29.7	641,822	417,155	53.9	70.43	51.85
Lake Central	8,596	8,770	—2.0	1,349	1,379	—2.2	139,893	154,450	—9.4	32.75	35.05
Mohawk	26,391	24,685	....	4,714	4,505	....	NA	453,454	....	NA	52.86
North Central	36,078	34,196	5.5	5,691	5,131	10.9	596,720	550,462	8.4	41.34	41.64
Ozark	19,152	20,258	—5.5	3,037	3,098	—2.0	316,925	317,673	—0.2	35.28	34.68
Piedmont	29,492	29,968	—1.6	5,955	5,999	—0.7	620,937	627,456	—1.0	51.11	52.74
Southern	15,747	13,895	13.3	2,850	2,420	17.8	297,138	257,845	15.2	42.68	39.46
Southwest	21,781	19,510	11.6	4,956	3,929	26.1	494,972	406,079	21.9	46.50	50.53
Trans-Texas	18,382	12,528	46.7	4,279	2,868	49.1	460,622	321,404	43.3	36.43	36.76
West Coast	13,902	14,513	—4.2	2,571	2,642	—2.7	249,660	259,850	—3.9	47.10	49.26
TOTALS	247,548	231,268	4.0	47,988	42,671	12.5	4,660,606	4,519,784	....	43.25	43.32
HELICOPTER SERVICE											
CHI Helicopter	447	.....	....	7	.....	....	2,852	2,612	9.2	28.30	44.92
Los Angeles	1,917	480	299.4	750	18	316.7	12,747	5,815	119.2	49.32	39.87
N. Y. Airways	3,371	2,592	30.1	62	50	24.0	8,519	8,349	2.0	37.40	56.90

NA—Not available.

How Bristol Licked Britannia Flame-Out

By ANTHONY VANDYK

The entry of the Bristol Britannia into scheduled service this month marked a victory for a team of engineers, meteorologists, pilots and researchers who had been working day and night for 16 months to solve a problem that threatened the future of the big turboprop transport.

The problem: how to ensure that the aircraft's Proteus engines sustained combustion when flying through ice-crystal cloud.

It was not until October 1955, just before the Britannia was due to enter service with BOAC, that the ice problem arose. Previously, in order to satisfy British government requirements for operation in icing conditions, a Proteus powerplant was tested in Canada and a Proteus-powered Ambassador was flown in England, with a spray rig in front of the port engine, to satisfy Air Registration Board requirements.

The Proteus came out of these two tests with unlimited military and civil clearance for operation in icing conditions.

Trouble Came As Surprise

During the tests the Proteus had satisfactorily ingested large quantities of glaze ice, some of which took the form of lumps of considerable size. It was therefore a surprise to all concerned when a BOAC proving flight in October 1955 reported engine flame-outs and "bumps" (momentary reduction of compressor speed) while passing through translucent ice-crystal cloud in the inter-tropical frontal region en route to South Africa.

Since these events happened in conditions in which there was no normally noticeable evidence of icing (such as build-up of ice on the wing leading edges) it was only after some hesitation that they were attributed to engine icing. Incidents were again encountered in similar weather conditions in Africa in April 1956 and over the Bay of Bengal in September 1956. There were also isolated reports of cases over the Mediterranean and Europe (including England) in highly developed cumulo-nimbus cloud formations.

• **Ice crystals** exist in decaying anvil heads of cumulo-nimbus cloud formations, and occur in sufficient concentration to cause engine malfunctioning only where the atmosphere has an abnormally high moisture content and the ground level is high enough to cause intensely active upcurrents. These conditions normally occur only in the inter-tropical frontal region. Ice crystals are then only to be found at ambient temperatures below zero Centigrade and altitudes above 16,000 ft.

It did not take BOAC and Bristol long to diagnose the trouble as being caused by dry ice crystals accumulating in the Proteus' air intake and thereafter entering the engine in a mass of sufficient size to cause a compressor pulse and combustion flame-out.

Unlike the solid pieces of glaze ice which had caused no trouble during the original icing tests, the dry ice crystals built up into a slush which was able to penetrate the entry guide vanes in a mass. This caused a severe instantaneous aerodynamic disturbance to the compressor and consequent rarefaction wave through the combustion chamber, resulting in a rich extinction which was assisted by quenching.

How Problem Was Solved

Having established the problem, it was decided to solve it in two ways: First, prevent the accumulation of significant quantities of ice crystals in the intake. Secondly, sustain combustion despite the ingestion of ice. The means available for attacking the problem were many and varied. The Bristol group of companies employed rigs, windtunnels and test benches as well as conducting flight tests both in England and in Africa. They were assisted by the National Gas Turbine Establishment on basic research, the Royal Aircraft Establishment on aerodynamic research and the Lucas company on combustion research. There was full cooperation from BOAC, the Ministry of Supply and the Air Registration Board.

It was believed that ice crystals were liable to be deposited on obstructions, recesses and discontinuities in the powerplant air intake. To assist in locating these trouble spots, up to 12 television camera mountings were provided on a powerplant to enable all parts of the intake passages to be viewed in flight.

Action was taken to segregate ancillary air intakes in a three-way duct, and to fair obstructions and discontinuities by spats or deflectors. It was also found beneficial to increase the capacity of the air valve supplying the entry guide vane heating.

• **Temperature of the tunnels** in the engine air-intake casting was found to be such that the ice crystals could deposit on them, and on the principle that ice crystals do not deposit on a cold surface (the aircraft structure), deflector plates were placed over the tunnels.

It was proved that tunnels numbers 1 and 8 were most susceptible to ice build-up, and deflectors over these two tunnels were found to provide an adequate degree of freedom from engine bumps and from ice damage. They have been adopted in the current BOAC modification standard.

Early de-icing trials with the Proteus involved the use of a special rig on Proteus-powered Airspeed Ambassador flying testbed.

After engine flame-out troubles were cured the Britannia finally entered service February 1 on London—Johannesburg route. This one is at Johannesburg's Jan Smuts airport.

The most recent flight tests in Africa have, however, shown that an engine with deflectors on all tunnels and also a one-piece spate between the struts beneath the heat exchanger shows considerable improvement.

It was essential that the modifications designed to permit satisfactory operations in dry ice conditions not affect operation in glaze ice conditions. This meant that the metal deflectors over the tunnels in the engine air intake casting, designed to present a cold surface to ice crystals, must nevertheless have heater mats behind them to clear the glaze ice operating condition.

Similarly, means must be provided for heating the spats on the engine mounting struts, the corona deflector and the individual duct scheme. In this connection the cowl heating ductstat temperature setting was increased from 185° to 215°C. A spray grid was rigged in front of one engine of the prototype Britannia.

Many Methods Investigated

Many methods were investigated to sustain combustion through an engine bump. Various types of duplicate ignition were tested, but complete success was achieved with glow plugs. After several thousand water injection tests on the testbed, at varying rpm and water injection rates, a 1½" penetration platinum/rhodium tube glow plug inserted at an angle towards the burner nozzle proved the best solution.

As proof that bumps are not deleterious to an engine, a testbed engine which had received 1,800 water injections was stripped on completion of 500 hours and found in perfect condition. Moreover, inspection of the jet pipes in the Britannia, which has borne the brunt of the flight testing, revealed no defects.

• **The combined research program** has enabled the Britannia to enter scheduled service but there is still much work to be done. Initial tests to overcome flame-outs were considerably handicapped because no instruments existed to measure dry ice meteorological conditions either qualitatively or quantitatively.

The RAE has greatly assisted in producing instruments which enable ice crystal sizes and their concentration in the atmosphere to be measured. It is hoped to be able to develop instruments which will provide the pilot with a foolproof indication by which he can correctly operate the powerplant anti-icing services.

In discussing the flame-out problem and its solution Bristol emphasizes two points. First, the design of the Proteus compressor and flame tube has been in no way contributory to the trouble. Secondly, in the course of testing the aircraft in icing conditions the worst weather was deliberately sought out in order to induce the maximum of incidents. Yet despite this the safety of the aircraft has at no time been hazarded, and relighting has always occurred without loss of altitude.

Sam Saint Says . . .

The Fire Brigade Breaks ATC Bottlenecks

The air traffic "experts" of the Air Transport Association were under discussion. The vice president-operations of a leading airline asked what these fellows did beside shuffle papers. The writer was stunned to find this highly respected vp knew so little about one of the key factors keeping his airline solvent.

Airlines survive today because the antiquated, inadequate, obsolete, "present system" of air traffic control can handle **six times the traffic** the hazardous, outmoded, "present system" of 13 years ago handled. In case there is another vp who doesn't know who did what to cause 60 fast nasty airplanes to move where 10 docile DC-3s moved before: Here are a few pages from the unpublished record.

SAINT

• **Without fanfare** or formal status a small group of men (including the ATA "experts") has been pulling big and little rabbits out of the hat for years to keep air traffic moving. Members of this fire brigade are experienced controllers, pilots, communicators. When trouble develops they come running from ATC Center, Tower, the basement of the Pentagon, the eighth floor of ATA, the driver's seat of an airplane. There is no written roll of members, no appointed leader, just individuals, whose status is established, not by agency badge of authority, but by personal know-how and demonstrated ability to contribute.

The fire brigade frequently acts on initiative developed within its own ranks, sometimes working within the framework of existing committees, but more often "conniving" productively off the record and behind the scenes. These working level firemen quickly reach agreement through common understanding of the problem and mutual respect for each other. Agency lines may disappear altogether in the sessions that wind up over a midnight cup of coffee. Hallmark of the breed is a common ambition to put the fire out and go home.

Here's an example or two from "Fires I Remember": After a year of **study,** ACC (SWG-5), with assistant secretaries nodding approval, recommended that radar control be tried at Washington National Airport. An implementing group muddled through another long year. Finally increasing traffic delays set off the gong and the fire brigade moved in. About six weeks later the radar system was turned on and traffic began to move, setting an example that was quickly followed at other airports across the country.

Pittsburgh was a perennial trouble spot. The anguished howl of an airline dispatch chief rang the gong off the wall. The fire brigade converged on Pittsburgh. No agenda. No terms of reference. Probably no one knows today who called the meeting. It took three days to pin down causes and prescribe by-pass routings for "over" traffic and changes to untangle the approach patterns of two airports. The Pittsburgh traffic jam was broken.

A few summers ago a six-day session of the brigade prescribed changes in the New York area, one-way airways, remote sites for direct communications etc. Traffic capacity in the New York area was increased by 20-30%. Again last year it took the fire brigade to straighten out an untidy situation in the New York Area to speed traffic with long-range radar.

• **Approach control,** direct communications, radar control, one-way airways—ever hear of a "trombone approach pattern"?—Pogo Stick (low altitude, tower-to-tower) control. These things, **largely initiated** and pushed into service by the fire brigade, have upped the traffic capacity of the ATC system six times in 13 years. True, this could not have been done without improvements in the basic tools of control. VHF navigation aids, ILS radar and large numbers of VHF and UHF voice radio channels have been equally important.

But what of the estimated $20,000,000 that has been spent on grandiose technical solutions of the ATC problem? What of Teleran, Lanec, Navar, Tricon, fixed blocks, moving blocks and blocks that do the hesitation waltz? What of the Data Transfer monster at Indianapolis? And ATUE? You'll be hard-pressed to convince a working controller that these have contributed anything at all.

Now, as we get ready to spend more millions for bigger and better boondoggles, the fire brigade is peering wistfully under the side of the Big Top. They hope for crumbs of advance information so they will be able to make something of the odd bits and pieces that will be left when they are finally called in. And they will be—unless the vp's decide to economize on "paper shufflers."

Airline Commentary

By Eric Bramley

Recently a prisoner being transported on an airline made a desperate attempt to get into the cockpit and take over control of the airplane. Luckily he failed; he was subdued by his guards. The attempt was made when the prisoner's handcuffs were removed at lunchtime. This could have been a serious incident. It brings up the question of rules covering the transportation of prisoners. A law enforcement official tells us that if he were in the airline business he'd insist that prisoners aboard aircraft be handcuffed and leg-ironed and that these manacles not be removed at any time for any reason. We're told that there are no tariff rules on this subject. Why shouldn't there be?

• • •

It's a little-known fact, but several years ago, before the trading stamp craze, a company approached the domestic airlines with a proposal under which "travel stamps" would be attached to certain merchandise in stores. Airlines would redeem books of the stamps in exchange for travel. The idea was accepted and endorsed through the Air Traffic Conference. But the company, known as Travelfares, never developed the scheme further. So now the airlines are withdrawing.

• • •

Another proposal for easing the no-show problem has fallen by the wayside, at least for the time being. It's National Airlines' plan, under which there would have been a basic fare plus a non-refundable "reservations charge" ticket. But the airline committee that's trying to draft an acceptable plan discarded NAL's idea at its first meeting. Evidently involves too many fare complications.

• • •

Two issues ago we called attention to an important meeting of the Air Traffic Conference's agency committee, to be held in late January. Before the group was the controversial question of commissions to travel agents on domestic tickets. Capital Airlines urged the airlines to pay 5% on one-way tickets, 10% on round-trips, and 5% on air travel plan sales. Only commission now is 5% on one-way and round-trip travel. We can reveal that the proposal failed for lack of a majority. One major airline supported it. Prediction: Capital will take its case before the top ATC meeting in April.

• • •

We congratulated Northwest Airlines on this page on its new promotional gimmick—a paperweight desk calendar. For want of a better description we called the calendar a 12-sided polygon, with one month on each side. Now Al Pereira, TWA's Miami sales manager, writes that it would have been better to call it a dodecahedron. The dictionary bears him out—a dodecahedron is "a solid having 12 plane faces." We bow to Mr. Pereira.

Sales, Traffic, Promotion

American Airlines entered a ticketing agreement with Southern Pacific Railroad similar to that signed last October by the railroad and **United Air Lines.** Southern Pacific will handle reservations and ticketing for AA at selected points in Arizona, California, Nevada, New Mexico, Oregon and Texas where the airline does not now have representation . . .

Delta Air Lines has adopted the name "Royal Scot" for its DC-7 coach service and "Flying Scot" for other coach flights. To introduce the name, Delta agents wore Scot tams and plaid sashes over their uniforms. Persons asking why were handed a copper penny on a card. The card said, "For the penny wise—Delta's Flying Scot flights" . . .

Northwest Airlines has bought 27 aluminum kennels for transportation of pets. The kennels, made by Kwik Kennel Co., Los Angeles, rent for $5 . . . NWA has just distributed 100,000 copies of a new direct-mail piece, "Practically Around the World With Jim and Tom Stoutfellow." This is a humorous, "soft-sell" booklet about two NWA pilots who set out to tour the system via auto and decide it's much cheaper to fly . . . Company is experimenting with Muzak taped music on its Honolulu DC-6Bs . . . It's also replacing web-cotton seat belts with Air Associates nylon ones. Latter are stronger, last longer, look better and are easier to clean, says NWA . . .

Jack Reid, **Pan American's** Cleveland sales manager, not only put on a successful sales promotion recently—he made a profit. PAA was participating in a "family fair" sponsored by the *Cleveland Press* and operated a booth to promote an $880 European tour (transportation via PAA) that the paper was offering its readers. Reid installed a large system map and covered it with large and small PAA emblems. Darts were sold for 25¢ apiece. Prize for hitting a large emblem was a PAA overnight bag; prize for a small one was a beach ball. Reid ended up taking in $425 more than his expenses, and donated the profit to charity. And 140 European tour reservations resulted . . .

Western Air Lines has been running a page in *Official Airline Guide* each month calling attention to its interline partners. Current issue features North Central Airlines, and shows a map of the two carriers' systems . . . New United Air Lines folder plugs company's DC-7 "red carpet" service, a "new standard in luxury travel" . . .

Braniff Airways Capt. Paul F. Van Maanen has authored a booklet, "Do-it-yourself Air Sickness Eradicator." Braniff has put copies on its airplanes. Capt. Van Maanen says that "when the entire body is in a completely relaxed condition, it is impossible to exhibit air-sickness." He then tells you how to become completely relaxed . . .

National Airlines' sales of winter package vacations to Florida and the Caribbean for the first month of the current season were 28% ahead of same period last year. Rental car bookings are up 93%, NAL reports . . .

Eastern Air Lines' Miami sales office, located for 25 years in the Columbus Hotel, has moved to larger quarters in the Pan American Bank Bldg., 150 SE 3rd Ave. City ticket office remains in the Columbus . . . Northeast Airlines' new Washington, D.C., reservations-sales office is located at 1415 Eye St., N.W. . . . Alaska Airlines opened its new city ticket-sales office at 1309 4th Ave., Seattle . . .

Spring tour to Europe for airline employes is being offered by **Air France** and **Lanseair Travel Service,** of Washington and Chicago. All-inclusive price for the 15-day trip is $454 from New York, $487 from Chicago. More information available at Air France offices . . .

Pan American-Grace Airways is now serving special meals to youngsters on its first-class flights. Passengers in the 5-to-12 age group get fruit cup, hamburgers, lemon meringue pie and milk. Another menu is tomato soup, chicken pie or chicken and turkey sandwiches . . .

"Ski New Horizons" is a new book written by Roland Palmedo and published by A. S. Barnes & Co., New York. **Pan American World Airways** supplied the material on 324 different ski areas in 26 countries. The new guide tells skiers what slopes have chairlifts and how much they charge, where and how to get ski instruction, how to travel with skis, accommodations available, etc. Available from PAA or the publisher at $4.95 . . .

Special Truck Speeds Cleaning of Airliners

Cleanup operations on United Air Lines planes between flights are speeded by specialized International Model SM-120 truck with Metro body. Truck is equipped with sliding roof door, roof platform, hinged aluminum ladder, heavy-duty vacuum and linen storage space. Truck is in use almost constantly, saves two manhours of labor per eight-hour shift.

HOW TO MOVE EMPLOYES, YET KEEP THEM HAPPY

M-H Tries New Gimmick: Fly the Family To New Site; Wine, Dine, Sign 'em

"Location: Florida." There's magic in this title of a brochure produced by Minneapolis-Honeywell's Aeronautical Division for a select group of employes. The brochure opens with this prelude to a balmy future:

"You have been chosen to be part of Honeywell's new Aero design and production facility in Pinellas County near St. Petersburg, Florida. You and some 300 other Honeywellers and your families will be the nucleus about which this new facility will be built."

With this overture M-H begins to roll out the red carpet in an effort to maintain good relations between the company and employes who will man key positions in its new Florida plant.

To Employ 1,400

• Slated for completion by summer 1957, the new Aero Division facility is expected to employ 1,400 by July. Primary activity will be M-H inertial guidance work.

Despite the "magic" in the name Florida, M-H designed a program to effect the employe transfer with a minimum of dissatisfaction or inconvenience to employes and their families.

From the brochure, which provides only a preview of what's to come, to an actual opportunity to breath the Gulf air, M-H is taking nothing for granted in an attempt to keep hard-to-find administrative and technical personnel happy.

The 38-page brochure gives a complete picture of the Florida site. It covers people, schools, housing, climate, recreational facilities, cost of living, taxes, health, churches and segregation.

• **No effort is spared** in setting down the statistical facts on all these factors likely to interest a family tearing loose from its moorings in the North Central U.S. where M-H is now located.

A 24-page insert, that appeared in the *St. Petersburg Times* in January 1956 containing the local school superintendent's annual report, comes with the brochure. Also floor plans, prices and financing plans for different types of homes.

Useful Information

A meteorological summary of the climate with comparative data also is included. Cost of living indexes are compared to those in Minneapolis. One of them says, "Tobacco (more expensive in St. Petersburg) and alcoholic beverages (cheaper). There is some price cutting in liquors."

Complete topographical and street maps of areas around St. Petersburg are attached to the brochure.

Aboard Honeywell's executive DC-3, employes and wives are given a chance to get the "lay of the land." They set out for Florida on a Thursday morning. A visit to night spots, guided tours of the area, rented car tours complete with maps and real estate literature, and talks with mayors, county commissioners, etc. occupy their time until Monday, when they return to Minnesota.

• **During the five-day jaunt,** all expenses, including those for babysitters, are paid by Honeywell. After return to Minneapolis an issue of M-H's *Florida-Bound News Notes* comes out with plans for a get-together social at a Minneapolis hotel.

There, the families exchange information, opinions and experiences garnered from the Florida tour. Films of the visited areas are shown to refresh memories. Then the "big" decision is made.

From then on, a "Florida office" set up in the Minneapolis plant and a "Honeywell hostess" at the Florida end take care of all details of the move.

No statistics are available on the number who have rejected the move.

UAW Plans to Organize Aeronautical Engineers

An aircraft and avionics engineering council has been established by the United Auto Workers in a move to draw engineers into union ranks.

"The rapid technological advances in the aviation industry accompanying the shift from piloted planes to missiles are drastically changing the composition of the labor force in the . . . industry," said Leonard Woodcock, UAW vice president and director of its national aircraft department.

He said the new council will aid engineers to affiliate with an organization that will preserve their identity. "At the same time, council membership will enable them to join with the production and office workers in the same corporation and industry to gain recognition and to effectively present and achieve their demands from the tightly-knit employers in this industry."

Personnel Changes

Mervin E. Dullum promoted to station mgr. for Delta Air Lines, Montego Bay, Jamaica.

William P. Bittenbender heads the Avis System International Div.

Walter Matson named foreman of radio maintenance shop at San Francisco International Airport.

Peter H. Thurridl transferred from KLM Royal Dutch Airlines' Lower Calif. area to Houston, Tex., office.

Vincent Concordia appointed dist. mgr. of Swissair's Philadelphia office.

Fletcher Y. Rainer, Jr. named passenger service mgr. for Continental Air Lines at Los Angeles International Airport; **Robert H. Magill** named passenger service mgr. in Chicago.

James A. Kennedy appointed regional affairs mgr. for United Air Lines in Denver area.

Miss Bess Russell named women's representative at Honolulu for United Air Lines.

Paul N. Dault named district traffic and sales mgr. at Buenos Aires for Pan American World Airways. He is succeeded at Sao Paulo, Brazil, by **Stuart P. Brown**; **W. Max Hartzog** moves up to d.s.m. at Rio de Janeiro.

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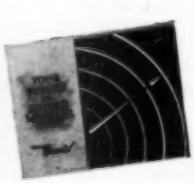

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Contracts

USAF Air Materiel Command announced the following contracts:

Allison Div., General Motors Corp., Indianapolis, Ind., $16,612,312, for C-130 propellers; $2,171,530, overhaul of T56 engines.

Sperry-Rand Corp., New York, $15,299,725, computers, amplifiers and indicators.

Collins Radio Co., Cedar Rapids, Ia., $9,974,311, radio receiving and transmitting sets.

Acme Precision Products Inc., Dayton, $5,888,851, liquid oxygen generating plant.

Thompson Products Inc., Cleveland, $4,317,379, overhaul of turbo-alternator drives and overspeed generators for B-52s.

Bendix Products Div., Bendix Aviation Corp., South Bend, Ind., $1,810,144, strut assemblies for B-52s; $4,131,450, wheel and brake assemblies for F-104s.

Boeing Airplane Co., Wichita, $1,542,346, dismantling and storage of B-47 tooling; $6,879,500, B-52 production facilities at Seattle.

Curtiss-Wright Corp., Wood-Ridge, N.J., $4,100,000 engineering improvements for J65 engines.

General Precision Laboratories, Pleasantville, N.Y., $3,030,941, antenna computer receiver-transmitter.

Aerodex Inc., Miami, $1,102,434, overhaul of R-2600 engines.

Link Aviation Inc., Binghamton, N.Y., $1,294,475, technical services.

Douglas Aircraft Co., Sacramento, Calif., $1,305,528, facilities for guided missiles development.

General Electric Co., $1,306,574, overhaul and modification of turbo-superchargers at Ontario, Calif.; $1,649,494, generator systems at Erie, Pa.; $1,394,030, signal generators at Syracuse, N.Y.; $1,637,083, radarscope cameras at Milwaukee.

Lockheed Aircraft Corp., Burbank, $8,369,744, engine flights tests for F-104A.

Northrop Aircraft Inc., Hawthorne, Calif., $3,366,647, flight tests for undisclosed equipment, $1,881,493, flight test instrumentation changes.

Solar Aircraft Co., Des Moines, $1,300,000, facilities to produce J75 components.

Champion Spark Plug Co., Toledo, O., $2,352,743, spark plugs.

Greer Hydraulics Inc., Jamaica, N.Y., $1,330,119 and $1,214,874, propeller governor test stands.

AiResearch Mfg. Co. of Ariz., Phoenix, $1,004,500, engine spare parts, tools and equipment.

Facilities

Bell Aircraft Corp. plans a $15-million expansion of its research and development facilities. Principal project will be the Lawrence D. Bell Research Center, to be built on a 100-acre tract in Cheektowaga, N.Y. Also planned are an electronic computer and data processing center, engineering research building and a development manufacturing shop.

Reaction Motors Inc. has moved its Los Angeles office to larger quarters at 10835 Santa Monica Blvd.

Rheem Mfg. Co. opened an electronics research laboratory and manufacturing facility at 7777 Industry Ave., Riviera, Calif.

Rochester Mfg. Co. has formed an engineering-manufacturing subsidiary, Rochester Mfg. Co. of California, in Pasadena, Calif., to produce high-pressure gauges for west coast aircraft and missile firms.

North American Aviation renewed lease on two buildings it occupies in Hawthorne, Calif., for another five years, with options for two additional five-year periods, and will move its Pacific Aviation facilities to this site, probably in September.

Sperry Rand Corp. will build a $2-million plant at Clearwater, Fla., for research in microwave physics and development of advanced radar and missile instrumentation.

Ruckstell Corp. has moved its offices and operations from E. Los Angeles to a new building in Azusa. Company makes permanent magnet alternators and auxiliary power units for the aircraft industry.

Berkeley Division of Beckman Instruments, Richmond, Calif., plans a $1.5-million expansion program that will triple production capacity and increase plant personnel by almost 1,000.

Bendix Aviation Corp.'s computer division has established a regional office at 919 N. Michigan Ave., Chicago.

Avco Mfg. Corp.'s Research and Advanced Development Division at Wilmington, Mass., has started ground preparation for its $15-million research and development center, which is expected to be in full operation by mid-1958.

THE BULLETIN BOARD

Undisplayed Advertising: $1.50 per line, minimum charge $4.50. Cash with order. Estimate 30 capital letters and spaces per line; 40 small lower-case letters and spaces per line. Add two lines if Box Number is included in lieu of advertiser's name and address. **Displayed Advertising:** $18.00 per column inch. Space units up to full page accepted in this section for classified-type advertising. Forms close three weeks preceding date of issue. Address all correspondence to Classified Advertising Department, American Aviation Publications, 1001 Vermont Ave., N. W., Washington 5, D. C.

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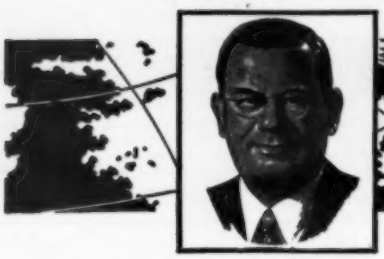
ADVERTISERS' INDEX

A C Spark Plug Division, General Motors Corp.	69
Aircraft Radio Corp.	41
Air Cruiser Co., Div. The Garrett Corp.	42
All American Engineering Co.	66
Allison Division, General Motors Corp.	46
Boeing Airplane Company	18
Canadair Limited (a Sub. of General Dynamics Corp.)	37
Collins Radio Company	5
CONVAIR—A Division of General Dynamics Corp.	1
Curtiss-Wright Corp.	58
Delta Air Lines	72
EMPLOYMENT SECTION	
Bendix Aviation Corp., Bendix Products Div.	84
McDonnell Aircraft Corp.	83
Fairchild Engine & Airplane Corp.	3
B. F. Goodrich Aviation Products, a Div.—The B. F. Goodrich Co.	28
Gulf Oil Corporation	11
Hitemp Wires, Inc.	62
Kearfott Company, Inc.	10
Laminated Shim Co., Inc.	14
Lear, Inc.	48, 49
Hotel Lexington	53
Lockheed Aircraft Corp.	16, 17
Martin Company, The	55
McDonnell Aircraft Corp.	52
D. Napier & Son, Ltd.	12
Nems-Clarke, Inc.	63
New York Air Brake Co., The, Watertown Division	70
North American Aviation, Inc.	34
Northrop Aircraft, Inc.	20
Pastushin Aviation Corp.	64
Phillips Petroleum Co.	88
Resistoflex Corporation	33
R. C. Robinson Company	65
Rolls-Royce, Limited	7
Scandinavian Airlines Systems, Inc.	51
Servomechanisms, Inc.	87
Sikorsky Aircraft Div., United Aircraft Corp.	44, 45
Society of The Plastics Industry, Inc., The	57
Stewart-Warner Electronics a Div. of Stewart-Warner Corp.	26
Swedlow Plastics Co.	15
Temco Aircraft Corp.	13
Twin Coach Company	56
Vertol Aircraft Corp.	6
Watertown Division, The New York Air Brake Company	70
Weber Aircraft Corp.	60
Western Air Lines, Inc.	8
Wm. R. Whittaker Company	19
E. B. Wiggins Oil Tool Company	2



EN ROUTE . . .

WAYNE W. PARRISH

Reverse Twist: Congo Cargo Supports Passengers

If you readers will readjust your sights from the strange activities of natives in the jungle for a few minutes, let me tell you about a truly fascinating development of the airplane in the Congo. And it isn't quite the usual story of how the airplane has replaced the horse and buggy; this one has some odd twists.

The Belgian airline Sabena operates a sizeable network in the big Congo. It has twenty DC-3s and C-47s, six DC-4s and three S-55 Sikorsky helicopters.

Instead of passengers supporting or making possible the freight business, it's the other way around. The reason why you can fly to many remote parts of the Congo is because freight is the main load and a few seats are made available for passengers. One-half of the total Congo air business is freight.

Contrary to what you might think, there is very little purely internal passenger traffic in the Congo. Most of the 88,000 Europeans who work and live in the Congo are under contract. They go down from Europe, they often work seven days a week, and then return north. They rarely see much of the country. The airline would starve to death if it depended on internal passenger business.

The airline has some strange competition. One form is steamships bringing vegetables from Europe. But the airline can deliver vegetables from the highlands in the east to the low country in the west (where vegetables can't be grown) at a lower cost than the steamships can bring the stuff from Europe.

Big Meat-Eaters

Both natives and Europeans are big meat-eaters. But what cattle are raised are all in the highlands of the east, so there is a vast meat demand on the lower Congo. The natives won't touch frozen meat. They'll eat only the fresh stuff, so the Congo airline does a big business flying tea up to the Lake Chad area of French Africa, about 1,200 miles distant, and returning with tons of meat for the natives. It also sends planes to the French Cameroons to bring in a better grade of meat for the Europeans.

If ever a big country (one-third the size of the U.S.) were dependent upon air transport, the Congo is it. Sabena hauls an average of 134 tons of meat a month. And the French share in the traffic, so the total brought into the Congo is more than that.

Another big item is fruit. Half the year it comes from Europe, the other half from South Africa, since the seasons alternate. Thus grapes, apples and other fruits are flown into the Congo all year round from some point or other. A lot of seafood such as lobster tails and frozen fish is flown from South Africa, eight tons a week to Leopoldville alone. But internally Sabena flies from 60 to 70 tons of vegetables a week from the highlands to the low country.

Within the country the airline competes with trucks and river boats, since there are few railroads anywhere. Trucks are offering the toughest competition since boat transport is slow. For example Sabena flies Leo to Stanleyville in four hours but a river boat takes eleven days.

Tonnage Going Up

Air tonnage has been going up steadily. In the first three months of 1953 Sabena's Congo tonnage was 725,174 ton-miles, while in 1956 the figure jumped up to 2,423,460 ton-miles. Cargo is almost exactly half the tonnage. In the first three months of 1956 there were 20,580 passengers carried.

Major Gaston Dieu ran the Congo division for nine years until he was moved up to the No. 2 spot in the company in Brussels late last year. He told me one of the handicaps of the operation has been limited utilization. Since the Congo straddles the equator, daylight hours are 6 a.m. to 6 p.m. all year round. Flying in the afternoons is often restricted because of heavy cumulous accumulations over the jungles and mountains. But it is hoped to start some night flying soon.

Radio homing beacons are used throughout the network. There are two VORs and Sabena hopes to standardize on these soon. There is no ILS because the Congo has no real visibility problems close to the ground. There is a radio teletype between Leo and Brussels, and between Leo and the seaport of Matadi, but radio telephone is used to connect the other centers within the Congo.

Reservations are handled by commercial radio telegraph. And the reservations job on some of the smaller lines is not an easy one because of the infrequent service and limited number of seats. Sabena has trained natives to work in reservations offices and uses natives wherever they are capable of being trained.

The airline suffers from two peak periods, each of which is one way. These are an Easter holiday period, when many Europeans are going north, and in September when they return. The two main traffic centers connecting with Brussels are Leo and Stanleyville, but the peak strain affects the whole Congo network.

There are few Europeans who have settled permanently in the Congo. Most of them are there for limited periods because the pay is high but they have no desire to stay longer than necessary.

Sabena is planning a $4-million hotel with 160 airconditioned rooms for Leo, (European population: 22,000 and natives: 350,000) and is continually building more housing for its own personnel. The big new airport south of the city will have one runway of 15,000 feet and the airline is getting ready for a boom. Europe will be hours closer by jet transport by 1960.

One thing the Congo could do would be to ease up on red tape at the airports. Customs and immigration are an unnecessary nuisance for visitors. Customs has four forms alone to fill out. Sabena welcomes tourists but the government people seem to do their best to discourage them.

While in Leo I discovered a new and bustling small outfit called Air Brousse in English. It is operated by Claude E. DeCoen, Serge Tabutant and Ray Linard and is a charter operation with address at P. O. Box 2438 in Leo. Last year the company got some mail contracts and is now serving many small strips in the jungle with its two 3-passenger Piper Pacers and two old but reliable 8-passenger de Dragon Rapides.

Air Brousse seems like a comer. It is agent for Van Dusen Aircraft Supplies and such products as Hartzell propellers, Scintilla magnetos and Marvel-Sheffiin carburetors. It services private planes. My personal observation is that Sabena should encourage small operators like this in the interest of the Congo, rather than opposing them as it seems to do. Air Brousse is providing a service (it has saved some lives, actually) which no one else is doing.

Bedecked, be-flowered and white-painted native dancer performing at Epulu in Congo.

HOW FAR IS

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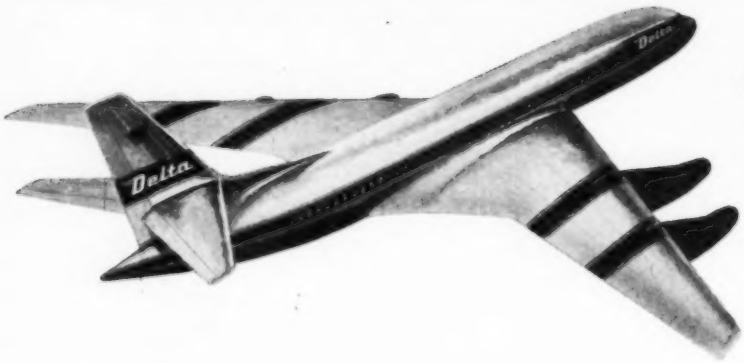

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